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THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

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Dietetics—*Anthony*

Orthodontic Ounce of Prevention—*Abell*

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EDITORIAL

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ROSCOE H. VOLLAND, D.D.S., M.D., M.Di., F.A.C.D., Iowa City, Iowa
President-Elect of the American Dental Association

THE JOURNAL
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Original Communications

THE RESTORATION OF FUNCTION AND APPEARANCE AFTER CERTAIN INJURIES OR IN DEFORMITIES OF THE JAW BONES AND MOUTH*

By VILRAY P. BLAIR, M.D., St. Louis, Missouri

IT will, I believe, more nearly fulfil the intention of the program committee if I confine this presentation to the consideration of certain typical injuries that have already completely healed but have left deformities that either hinder the dentist in his work or call for his skill for their correction.

Scars within the buccal cavity, fixation of the joint or deformity of the jaw bones may embarrass the prosthetic dentist and the orthodontist, or may hinder ordinary dental treatments or extractions. The functional disturbance for which the patient seeks help may result from the presence of one or several of the foregoing conditions, and it will be expedient to exemplify them singly and in combination.

*Read before the Midwinter Clinic of the Chicago Dental Society, Jan. 27, 1926.

LOSS WITHIN THE LINING OF THE MOUTH

Except in those locations in which the mucosa of the mouth is directly attached to the underlying periosteum, as on the palate and gums, the healing of a loss of the full thickness of the mucosa is accomplished largely by the drawing together of the edges of the membrane bordering the raw area. The lining of the cheeks, lips and floor of the mouth is bedded upon a somewhat loose areolar tissue and is capable of great stretching and sliding. This permits the surface obliteration of defects of considerable size but may entail permanent derangement of the contour or function. Therefore, in planning a surgical correction, the distortion and fixation of the neighboring tissues, not the size of the scar, are the

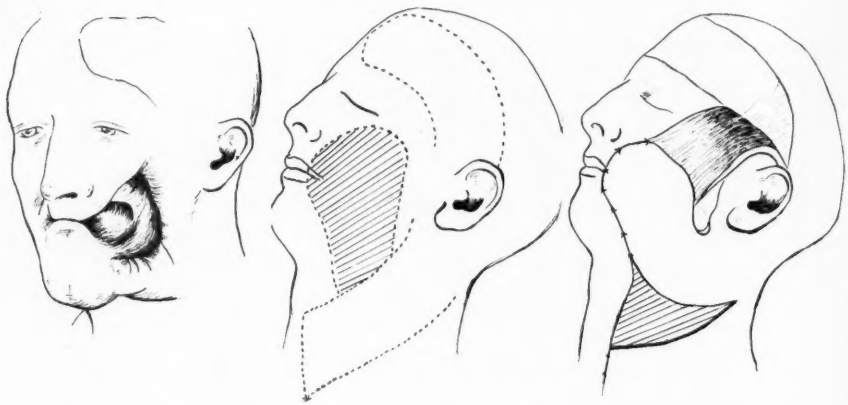

Fig. 1.—Restoration of the full thickness of the cheek by two separate pedicle flaps. Left: The condition three months after the full thickness of the cheek, the alveolar process and the external covering of the body of the lower jaw were removed with the cutting cautery and the soldering iron for an extensive carcinoma arising in the mucosa of the cheek. Center: Extent of the original destruction (striped area), and (in outline) the lining flap that was taken from the forehead, and the covering flap taken from the neck. Right: Flaps sutured in place. Later, the pedicle of the lining flap was cut and the base returned to the forehead. The blood supply of the new lining comes from the covering flap, which had been so planned that its pedicle was retained. The final result is shown in Figure 2.

guide to the amount of lining to be replaced.

After a loss in the mucosa, or of mucosa and underlying structures, the tongue may be bound down to the floor of the mouth or to the alveolar process or, if the alveolar process is missing, the tongue may become adherent to the cheek or to the lip, the normal vestibular sulcus being thus obliterated. Destruction in the mucosa of the pharynx may be followed by adhesion of the velum, which causes partial or complete atresia of the nasopharynx, or adhesion of the tongue that partially obliterates the lower pharynx; while loss of the faucial covering will cause the dorsum of the tongue to be drawn up toward the velum.

Partial atresia of the nasopharynx will affect nasal respiration and voice

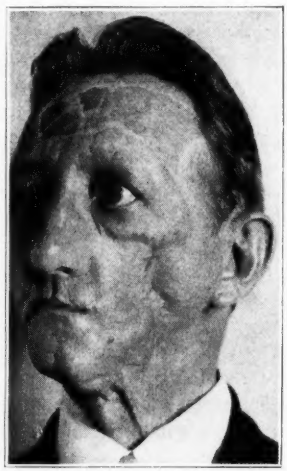

Fig. 2.—Final result in the case illustrated in Figure 1.

quality. Total obstruction not only compels mouth breathing but also, by lack of posterior drainage of the nasal fossae and of aeration, may tend to impair the function of the eustachian tubes. Fixation of the tongue to the fauces or posterior wall of the pharynx may interfere with swallowing; while fixation of the anterior part may affect speech, the intra-oral manipulation of food during mastication and the natural hygiene of the mouth. A scar within the cheek may limit or prevent separation of the jaws, and this will, of course, preclude mastication. Attachment of the tongue, lip or cheek to the alveolar process for even a small distance may be a handicap in the hygiene of the teeth and give rise to serious difficulty in the fitting and wearing of a dental plate. Any considerable fixation of the lip or cheek may affect contour or expression.

The surgical correction of any of these conditions is the release of the area of acquired fixation by cutting or excising the binding scar and the immediate epithelization of the resulting raw surface. In doing this, allowance should be made for some subsequent

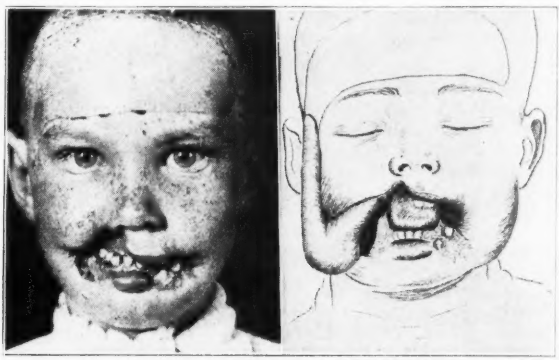

Fig. 3.—Left: Appearance of child who had lost the greater part of both lips and the lining of both cheeks, probably as the result of noma. Right: Jaws blocked open after the removal of the intra-oral scars that bound the maxilla to the mandible. The raw inner surface of the right cheek was lined by the tip of a long pedicle flap taken from the forehead, and the left cheek by a flap taken transversely from the upper part of the neck with the base of the pedicle on the right cheek. When a patient presents himself with the jaws tightly fixed together by intra-oral scars, the extent of the original destruction, and the subsequent scar formation, may be largely a matter of conjecture. A narrow but firm band in one bicuspid region may fix the jaws almost as firmly as the complete destruction of the lining of both cheeks. In this case, before attempting to separate the jaws, it was surmised that the intra-oral scars replaced the whole of the lining of the right cheek and the anterior part of the left. The long forehead flap was prepared for delayed transportation into the inner surface of the right cheek. At the second operation, when the cheek scars were cut, it was found that they extended back to the ramus of the mandible and the maxillary tubercle on both sides. The neck flap was raised and immediately transplanted into the left cheek and, as not infrequently happens with immediately transplanted flaps, the distal part of this neck flap sloughed. The scars at the posterior border of each of these flaps were subsequently released by inlay Thiersch grafts. The long pedicle of the forehead flap was later used to form the external surface of the lips.

scar contraction, and the raw surface should be stretched to the physiologic limit while the newly applied Thiersch graft or epithelium bearing flap is healing in place.

Fig. 4.—A molded wax form, a scant 7 cm. from tip to tip, that was fitted into the sulcus which resulted from freeing the lip from the stump of the maxilla. The wax form was then removed, and covered with a Thiersch graft, raw surface outward, and then held in the new sulcus by suturing together the cut edges of the mucosa over the graft covered form. At a subsequent operation, the cheeks were freed by a similar procedure. In the final condition, this sulcus was lined with about 24 sq. cm. of surface epithelium. (Compare Figure 5.)

There are four general plans by which raw surfaces in or about the mouth may be epithelized in preparation for, or after the release or removal of, a scar.

The oldest, least efficient and least commonly applicable plan is the establishment of a narrow epithelized tract within the normal tissue beyond the scar by means of a seton left in place until the epithelium grows in and lines the whole tract, as when the ears are "pierced" for earrings. When this tract has become epithelized throughout, the scar is cut through into the tract as in an operation on an anal fistula. The narrow line of epithelium at the bottom of the cut will prevent the reunion of the two raw surfaces if they are not allowed to remain in contact during the healing, but it will not prevent their

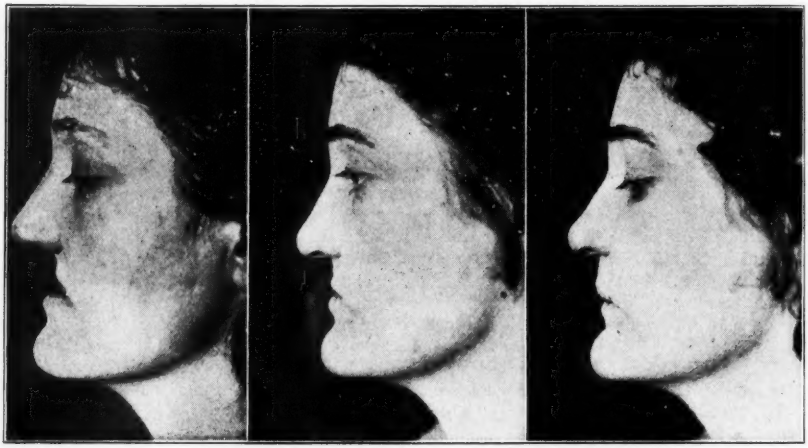

Fig. 5.—The replacement of the premaxilla and part of the maxilla by a prosthesis that is filled into a sulcus made permanent by lining it with inlay Thiersch grafts. Left: Appearance of patient before operation. Center: Result of freeing the lip, the prosthesis not being in place. Right: Patient with upper plate in place. (Compare Figure 4.)

subsequent contraction. This plan has been used in releasing adhesions of the velum and narrow cheek bands, but there is no place where it cannot be advantageously replaced by a properly applied inlay Thiersch graft.

Owing to the normal superabundance of the buccal mucosa, certain raw surfaces can advantageously be covered by using a pedicle or sliding flap taken from the immediate neighborhood. The mucous flap is most useful for the covering of small areas, such as the raw surface resulting after the simple excision of a narrow band, restoration of the vermilion border of the lip, the release of a mucous plica in the buccal fornix, the correction of tongue-tie and restorations about the nasopharynx. The use of a mucous pedicle flap usually presupposes that the resultant raw surface can be closed by drawing together its mucous edges by immediate suture, by scar contraction or by Thiersch graft, without impairment of function.

A pedicle skin flap can be turned in from the outside, through the oral fissure or through some artificial opening. Later, after the flap has obtained a new blood supply, the pedicle is cut and returned to its original bed. Only hair-free skin should be used, as otherwise the hair will continue to grow after the skin is transplanted in the mouth. This may happen with deeply cut Thiersch grafts taken from the thigh.

The skin covering a flap that has been transplanted in the mouth becomes pink and somewhat resembles mucous membrane. In a few cases, it raised up in wartlike ridges. This was interpreted to mean that an excess of skin had been used, and the condition was relieved by removing part of the transplant.

The simplest and a widely applicable plan of epithelizing freshly made raw surfaces within the mouth is by means

Fig. 6.—Restoration of the lining of the cheek partly by the turning in of a pedicle flap from the skin of the cheek (base posterior), and then later by the reconstruction of the cheek defect by splitting a tubed arm flap so that part serves for lining and part for covering. Left: Appearance of patient when she came to the Children's Hospital, before this final series of operations. The jaws are firmly locked. There is a fistula through the cheek and the latter is so infiltrated with scar that it would never permit free movement. On the neck are seen some of the scars that resulted from previous attempts to repair the cheek lining. Center: Appearance of patient when skin of the cheek was turned in to line the posterior part of the left buccal cavity. Right: Final result. Some of the neck scars have been made less conspicuous and the patient is able to open the mouth to a degree fairly approaching normal. (Compare Figure 7.)

of a Thiersch graft draped over a form that holds the graft in close contact with the bare area. When properly done this type of skin graft usually "takes" throughout regardless of the fact that the raw surface has almost necessarily been contaminated with saliva. Even pressure that controls oozing and prevents accumulation of fluid between the graft and the bed seems to insure prompt healing in the majority of cases.

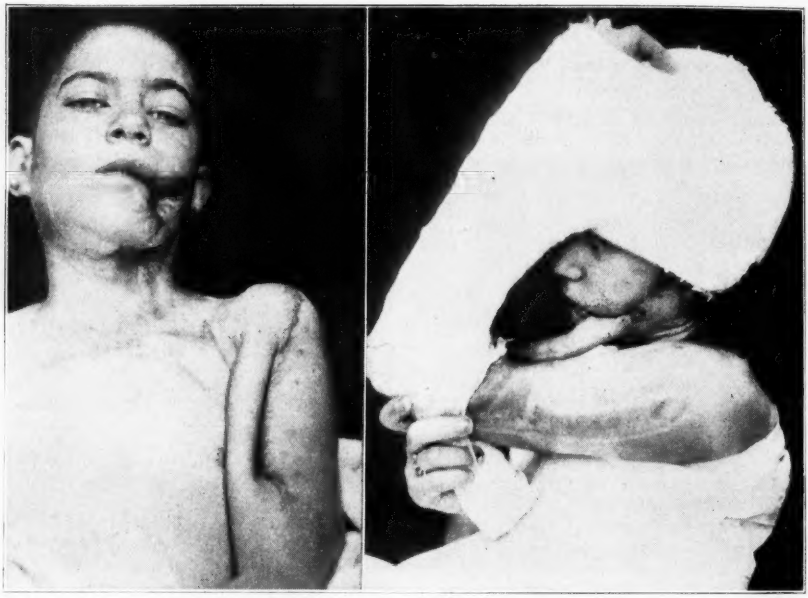

Fig. 7.—Left: Tubed flap prepared on the arm for reconstructing the cheek in the case illustrated in Figure 6. Right: The tubed flap in place. The upper pedicle has been cut and the skin of the end of the flap split so that part will line and part cover the new cheek.

The general plan of stretching a Thiersch graft over a wax form and burying it in the tissue was brought out during the war chiefly by Esser, and by Gillies and Waldron. Esser buried his graft in a sterile field only. When it was intended that the graft should line part of a mucous cavity, the graft-covered form was buried under the scar through an incision made from the skin surface, which was sutured. Later, the mucous scar was incised so as to convert the grafted cavity and the mucous cavity into one. Waldron and Gillies very much simplified this procedure by incising directly into the skin or mucosa, as the case might be, disregarding any ordinary sources of contamination. We employ the latter plan in all our cases.

In some conditions, the inlay graft can be used supplementary to the pedicle graft or vice versa, or a mucous graft may supplement a pedicle skin graft. A pedicle skin graft turned in to form

the lining of the cheek may heal perfectly and yet leave a binding scar at its anterior border that will still limit the opening of the mouth. This might subsequently be released by incising the band and then covering the resulting raw gap with an inlay graft, or a mucous pedicle graft, the mouth being blocked open while the latter is healing in place. If the buccal scar is attached directly to the alveolar process, either above or below, the obliterated fornix will not be restored by simply lining the cheek with a pedicle flap, but will require, in addition, a deep inlay graft after the pedicle graft has healed in place. The scar at the posterior part of the flap may require the same treatment. The inlay Thiersch graft may be used immediately to cover the raw surface from which a pedicle mucous flap has been raised, and this inlay graft can be used in combination with mucous pedicle grafts in correcting atresia of the nasopharynx. We have successfully used this plan to cover the raw surface immediately after excising an epithelioma of the cheek with a cutting cautery.

The essential difference between the Thiersch graft and the pedicle graft, whether of skin or mucosa, is that the latter carries with it the derma and the submucosa or subcutaneous tissues, while the former consists of epithelium alone or epithelium and a very thin layer of derma. In making the choice, one may

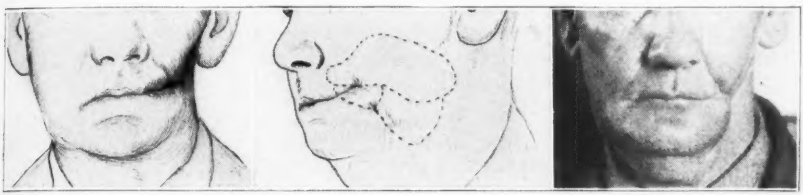

Fig. 8.—Simultaneous use of multiple inlay grafts to line the large sulcus that resulted from freeing the cheek from the maxilla and stump of the mandible after the cheek lining and much of the adjacent covering of the upper jaw had been destroyed with a cautery and part of the body of the lower jaw had been removed for extensive carcinoma of the cheek. Left: Lower face of patient, showing scar of approach and the retraction due to adhesion of the cheek to the maxilla and to partial loss of the body of the mandible. Center: Position (outlined) of three pieces of wax (Fig. 9) that carried the inlay grafts. Right: Appearance of patient after the grafts had healed in place.

Fig. 9.—Three pieces of wax that carried the inlay grafts employed in the case illustrated in Figure 8.

be influenced by expediency as well as by the needs of the particular case. The pedicle skin flap with a varying amount of subcutaneous tissue is most useful in the restoration of the whole lining of the cheek, especially in those cases in which a considerable thickness of the cheek is to be restored. When the full thickness of the cheek or lip is lost, two pedicle skin flaps may be used in combination, one for the lining and one for the covering. In the Martin technic, the sulcus, which receives the prosthesis that substitutes for a section of the body of the mandible, can advantageously be lined by a pedicle skin-bearing flap graft. This flap, at times, can best be prepared before the section of bone is removed. The raw surface of the pedicle flap may be grafted (Thiersch) before or after it is transplanted. It is safest to use these skin-bearing flaps as delayed transplants, but this procedure is not so frequently necessary nor so practical when mucous flaps are employed.

Because of the simplicity of application and the rather uniform certainty in results, the inlay Thiersch graft, applied over a form, has the widest field of usefulness in replacing the epithelial lining of the mouth. This inlay graft is the most effective means of restoring the buccal or labial sulci, lengthening the mucosa of the lip, covering raw surfaces after shifting a mucosa flap,

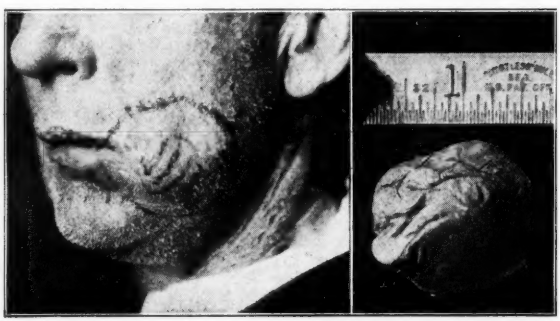

Fig. 10.—Use of inlay graft on the wax form inserted immediately after the deep removal of a carcinoma of the inside of the cheek with a cutting cautery. Left: Lower face of patient. The outer circle shows the size of the surface of the defect that resulted from the removal of the cancer. In its deepest part, the defect extended to the subcutaneous fat. This hole was immediately filled by the wax form shown at the right, which was covered with a Thiersch graft. All of the graft "took" except that in contact with the subcutaneous fat over the area shaded in the inner circle. This immediate grafting helped to avoid a secondary operation that otherwise might have been necessary to restore the cheek lining to permit opening of the mouth. The diameter of the sphenoidal-shaped wax form was considerably smaller than the diameter of the defect indicated here, but after implanting of the graft covered form, the mucous borders were drawn together in a longitudinal suture line, burying the graft, so that the area grafted corresponded to the whole surface area of the wax form. This was approximately 4½ square inches, while the fat area over which the graft failed to take was not over 1 square inch. It will thus be seen that the ungrafted area is proportionately very much smaller than appears from these surface markings.

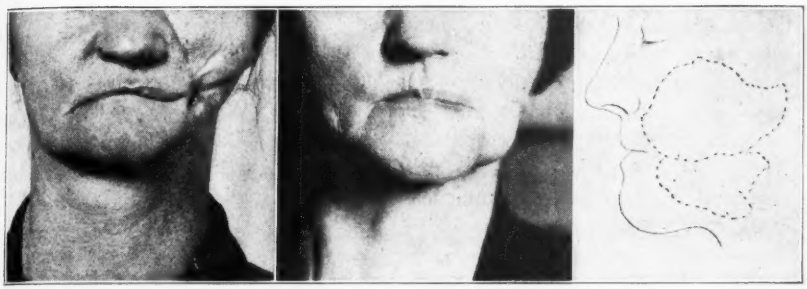

Fig. 11.—Employment of multiple buried inlay grafts in association with covering and lining pedicle grafts in the reconstruction of a damaged cheek. Left: Appearance of patient, who, as the result of the reaction that followed the extraction of a tooth during the acute stage of infection, suffered destruction of part of the full thickness, and all of the lining of the cheek, leaving her with the jaws locked, a fistula through the cheek, and the cheek itself distorted and adherent to the underlying bones. The cheek was pieced out with two flaps from the neck, which furnished both lining and covering to replace the immovable scar. On account of the close adhesion of the remaining cheek tissue to the jaw bones, this but partially relieved the locking of the jaws and did not relieve the distortion and flattening of the upper part of the cheek; therefore, the soft tissues were freed from the bone as high up as the upper border of the maxilla and down to the lower border of the mandible, and two pieces of wax (Fig. 12) were molded into these sulci. The Thiersch grafts "took" throughout, and the view of the patient in the center shows the final condition. The cheek is filled and smoothed out. The patient has a free opening and is now wearing an upper and lower denture. The undue prominence of the lower part of the new cheek is related to the hurry and difficulties of operating on an excessive bleeder. She had four transfusions during the series of operations. The drawing to the right shows the position and relative size of the wax forms which, after being covered with Thiersch grafts, were sutured in the newly made sulci. All Thiersch grafts are made of excessive size in order to allow for shrinkage.

releasing the scar band at the edge of an implanted skin flap and releasing pharyngeal adhesions.

The wax form keeps the raw surface stretched while the graft is uniting, but

Fig. 12.—Wax forms employed in the case illustrated in Figure 11.

Fig. 13.—Wax form which, eight months after the first operation in the case illustrated in Figures 14 and 15, was covered with a Thiersch graft and buried in a sulcus formed by an incision through the mucosa just anterior to the cartilage graft and extending down to its lower border. The entire graft united.

there is a variable amount of subsequent contraction, which is always considerable. In using this type of graft, where possible an allowance for at least 60 per cent contraction should be made. That is, if it is desired to restore the buccal sulcus to a depth of 5 mm., the incision in which the graft is to be buried should be made 15 mm. deep and the wax form should be 10 or 15 mm. in diameter.

LOSS OF BONE

Except when limited to the palate, losses from the substance of the maxillae are best compensated for by prosthesis, but, as pointed out in the preceding paragraphs, liberation of the soft structures, with restoration of the lining, will often facilitate, or be a necessary preliminary to, the making of the artificial denture. It is not always expedient or necessary actually to restore

Fig. 14.—Case illustrating the use of the buried skin graft to allow for the use of a tooth carrying a prosthesis that would compensate for lack of development of the lower jaw. This 22-year-old youth lost all the teeth and tooth buds in the lower jaw, with the exception of the left third molar, at the age of 6 years. The jaw did not develop where the tooth buds were lost; therefore, he had a 6-year-old lower jaw. The ramus was too poorly developed to permit of a sliding operation, and he had neither the time nor the money to allow him to have a series of bone grafting operations. To give some body to the chin, a large piece of the eighth left costal cartilage was grafted in front of the bone and the neck covering was slid upward. Eight months after this first operation, the wax form shown in Figure 13 was covered with a Thiersch graft and buried in a sulcus formed by an incision through the mucosa just anterior to the cartilage graft and extending down to its lower border. The entire graft united. Left: Appearance of patient before operation. Right: Final result. (Prosthetic restoration by Dr. James Brown.)

In making the incision to restore the buccal sulcus, the dissection should be made close to the periosteum; otherwise, a pad of soft tissue lying on the bone may interfere with the future fitting of a dental plate and require some minor secondary operation.

a lost section of the body of the mandible, but when this is desired, a bone graft is usually the preferable procedure. This will necessitate the fixation of the fragments, often by the use of a dental splint. When but a part of one half the mandible is missing, it is usually

simpler to liberate the displaced bone fragments by a cutting operation rather than to attempt to stretch an old scar purely by splint pressure. Attempts at the latter are likely to be more time consuming and painful than effective.

ANKYLOSIS

It has never been my good fortune to encounter a case of ankylosis of the tients who had been previously "cured" by repeated stretching.

A true joint ankylosis developing during the growing period will, in time, be accompanied by a retraction of the jaw on the ankylosed side and, if it is unilateral, the chin will also deviate from the midline. In correcting such an ankylosis, one should not be content with a simple resection of the joint, but

Fig. 15.—Profile view of patient shown in Figure 14. Left: Before operation. Right: Final result.

jaw developing gradually during the growing period that was permanently relieved by any form of intra-oral stretching. The case illustrated in Figure 21 is one that I thought had been cured in that manner, but when the patient reported several years later, the progress of the ankylosis proved to have been but temporarily interrupted. We have operated on a number of pa- the mandible should be forcefully drawn forward and held in the best obtainable position. (Figs. 24-27.) To do this, it may be necessary to remove the whole of the ramus on one side (Fig. 26), but I should not care to remove both rami; at least, I have never done it. After removal of both condyles, the teeth should be fixed in occlusion for at least six weeks. Other-

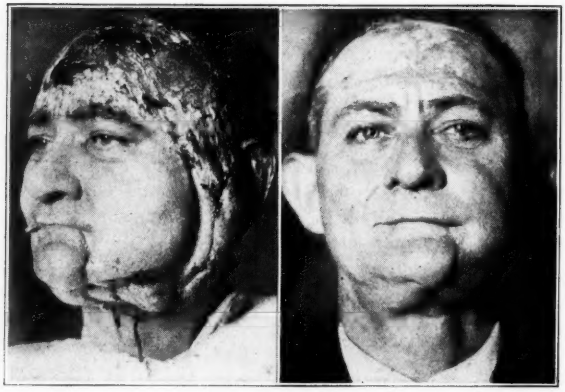

Fig. 16.—Case of cancer in which the left body of the mandible, floor of the mouth and full thickness of the lower half of cheek and submaxillary regions were removed with cutting cautery. Repair was made with the forehead flap divided so that one-half was used for the external cheek defect and one-half to line a sulcus that received a prosthesis to replace the lost half of the mandible. Left: Appearance of patient, showing the wide pedicle flap dropped from forehead and implanted in the defect. Right: The final repair with pedicle cut and returned to the forehead. The surface irregularities could be easily adjusted, but he is a laboring man and has returned to his work and does not mind the appearance. The prosthesis is shown in Figure 17.

wise, a paradoxical movement is liable to develop. We have had this happen, and it is annoying.

If the ankylosis has resulted from early deep scars within the mouth, the ramus on that side may become abnormally wide from before backward or become united to the maxilla. In either case, a bone operation will be necessary in addition to the removal of the scar and restoration of the soft parts.

A number of the illustrations referring to the lining of the mouth are from an article entitled "The Surgical Restoration of the Lining of the Mouth."[1]

For extreme retraction of the maxilla, whether natural or the result of an

1. Blair, V. P.: Surg., Gynec. & Obst., 40: 165 (Feb.) 1925.

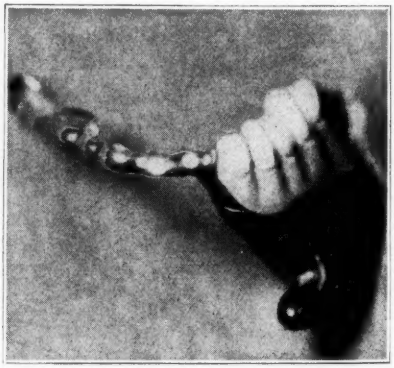

Fig. 17.—Denture (by I. B. Dunhaupt) supplied patient shown in Figure 16. The body fits into the skin-lined sulcus, while the hook fits into a little pocket made to receive it. The clasp fits the teeth of the opposite side. The patient can chew soft things on this side and eats a laboring man's food without inconvenience.

early osteoplastic operation for the closure of a cleft palate, we have developed an operation which, at times, will be of practical interest to the dentist as it brings the lip forward and gives not only an improved facial outline but also room for a prosthesis that carries the incisor teeth to their proper positions. When performed early in life, it can also facilitate the work of the orthodontist. It consists in liberating the lip and cheek from the maxilla, and the columella from the nasal septum, and moving these soft structures forward. They are retained by sutures and allowed to heal in this new position. (Figs. 28-30.)

Fig. 18.—Case in which the lining flap was prepared before one-half the body of the mandible was excised for a tumor of low-grade malignancy and in which the lost bone was later replaced by a tooth-bearing prosthesis. Left: Appearance of the patient, who had had a partial amputation of the body of the jaw with bone graft for a cystic adamantinoma. The bone graft was short as shown by lack of incisor occlusion and the retracted chin, while the amputation was still shorter, because the tumor recurred in both ends of the bone. The tubed pedicle flap was prepared and also a splint made by Captain P. Paquin, D. C., of the Veterans' Hospital, that would hold the left half of the mandible in proper relation with the maxilla after the removal of the right half. When this neck flap was ready for use, the right half of the mandible was removed with the tumor, the left base of the flap was cut, and the tube opened up and used to line the sulcus from which the bone was removed. Two weeks later, the right base was cut and the pedicle adjusted within the mouth. Captain Paquin made the prosthesis (Fig. 20). Center and right: On comparing the two views of the patient, it will be seen that the chin has been brought forward to its normal position, which restored the proper occlusion of the incisors.

DISCUSSION

Louis Schultz, Chicago, Ill.: Reference was made by Dr. Blair's paper to an impairment of function of the eustachian tubes in cases of obstruction of the nasopharynx due to partial or complete atresia of this cavity. I have seen many cases presenting all the handicaps which the resulting mouth breathing imposes, and frequently involvement of the eustachian tubes, which did not stop with the lesion in the tubes themselves, but caused middle ear disease of various types, acute, chronic, catarrhal, suppurative, from the mildest to the most severe, sometimes complicated by mastoiditis, etc. The degree of

atresia, the amount of congestion caused by such obstruction, the presence or absence of infection, the type of infection, if present, and the particular anatomic relations in the patient govern the result. Obstruction of the nasopharynx, no matter from what cause (and the most common cause, by the way, is found in adenoids and tonsils) should be viewed always as serious, and prompt relief advised. Most of us, I take it, have seen patients presenting scars within the cheek limiting or preventing mandibular movements, and, in this connection, I want to emphasize what Dr. Blair has stated in his paper. If such scars occur during the developmental period, they result in a retraction of the mandible aside from the spurious ankylosis which it produces. I know such a patient, a young lady, who is greatly deformed by a failure of development of the mandible, resulting in a marked recession of the chin, and since the scar is on the right side, there is a deviation of her chin to this side. Mandibular motion is almost nil, but she refuses operation. Scar stretching by means of wedges or gags, even if persisted in for a long period of time, has not been

Fig. 19.—Case shown in Figures 18 and 20.

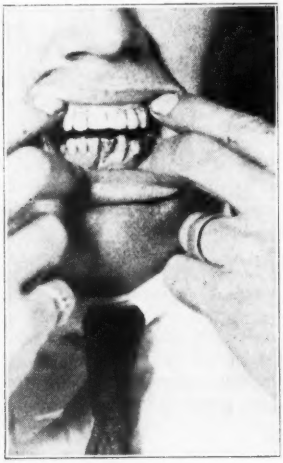

Fig. 20.—Prosthetic restoration made for patient shown in Figure 18. The teeth to the right of the midline are carried on the prosthesis, which gives, on the average, good service, but has not the same resistance to hard food as an ordinary plate resting on bone.

Fig. 21.—Case of a woman, aged 24, who had an injury to the jaw at the age of 9 years. There was ankylosis of both joints, and an attempt was made to loosen it by intraoral stretching. The patient returned several years later and a resection of both joints was performed. The jaws were stretched and blocked open. The patient now has an open bite which will have to be corrected.

satisfactory in my hands. But in minor cases, in scars occurring in narrow bandlike form, limiting the motion of the lower jaw, one can give relief by removing the scar and severing all existing deeper adhesions, thus obtaining a full, free excursion of the mandible. A proper extension of the incision, through the mucosa only, at right angles to the length of the scar, followed by uniting the two ends of the incision, may correct the defect because of the great amount of shifting and stretching of which this structure is capable. In planning an operation of this kind, one must heed Dr. Blair's warning not to produce a permanent derangement of neighboring tissues and disturbance of function, which might result, for instance, if in the shifting of the mucosa to its new position, the direction of Stenson's duct were changed or the duct were perhaps kinked. If this method is not adapted to the case in hand, Thiersch inlay grafts held in place by an accurately fitting modeling compound splint may be used, as advocated by Dr. Blair, and splendid results be obtained, for these grafts "take" readily. This was again brought home to me at a clinic last week in which Dr. Blair not only demonstrated this form of repair by actual operations on patients but also showed the results obtained in recent cases. As a point of information I should like to ask Dr. Blair to tell us his experience with and opinion of the use of thiosinamin or fibrolysin, also that of iodolysin for the purpose of removing

Fig. 22.—Above: Appearance of youth, aged 20, showing deformity, which began at the age of 16, with some inability to open the mouth, and was due to some damage to the joint on the right side, resulting in ankylosis. Below: Correction by resection of joint, wiring jaw toward opposite side and using orthodontic appliances to pull it over farther.

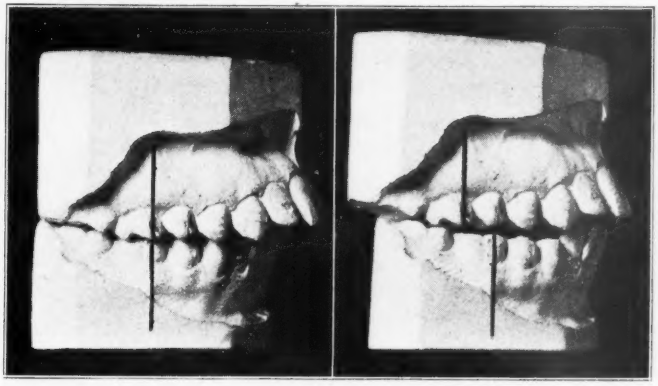

Fig. 23.—Models of case illustrated in Figure 22.

scars by dissolving them. I have not used these agents, although I have been tempted to in minor and seemingly suitable cases. I believe in the fundamental principle that large scars should be prevented whenever possible and corrected as far as possible wherever found, because the resulting contraction may lead to distressing deformities, and because they may become the seat of keloid, and, having a poor blood supply, are prone to undergo ulceration from very minor causes such as a slight trauma. Last, but not least, it should not be forgotten that they are apt to undergo malignant change. In a complicated case of

Fig. 24.—Models of case illustrated in Figure 22.

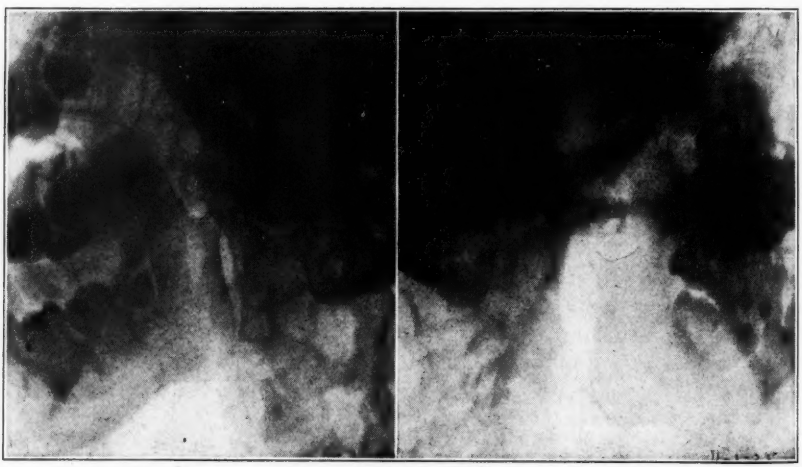

Fig. 25.—Case of a girl of 13, who, at the age of 7, had an injury to the chin, after which she was unable to open the mouth fully. During the twelfth year, the mouth opening diminished further and the chin receded noticeably. Correction was made by resection of both condyles, holding the jaw forward and later filling out the chin with a cartilage transplant. Both sides are shown after resection.

fracture of the mandible which I recently brought to successful termination, the patient had had double fracture in the cuspid regions and a fracture extending from the right sigmoid notch to the posterior border of the ramus, severing the condyle from the lower jaw. This fragment was of such size and shape as to have but one muscular attachment, namely, that of the external pterygoid. This patient had been attended by a physician, and union of the fragments in the cuspid regions and fair reduction of those fragments to normal had been obtained. The operator failed to do anything for the overriding fracture of the right ramus and, using force in his eagerness to get full excursion of the jaw, after union had taken place, dislocated the left mandibular articulation. As a result, luxation occurred on every attempt to open the mouth sufficiently to be able to eat. This was corrected by temporary immobilization. My point relating to the present paper refers to the fragment containing the right condyle, which the radiogram disclosed in front of the eminentia articularis. To reduce this fragment would have meant an open operation

Fig. 26.—Case of a man, aged 24, who had necrosis of the jaw and bony ankylosis of the right joint after some dental trouble at the age of 6 years. Part of the right ramus was resected and the jaw drawn forward. Further correction was to be made by a cartilage transplant.

Fig. 27.—Case of a girl of 15 with ankylosis of the jaw following injury. The joint was resected. Ten years later, the jaws blocked open, and later a piece of cartilage was put in to fill out the chin defect.

into the joint, endangering such important structures as the joint itself, the facial nerve and internal maxillary artery, and the operator spent some time in deciding what treatment he would elect. After the period of immobilization, another radiogram was made, and this showed that the fragment had now been pulled underneath the zygomatic arch, lying at no point in contact with the mandible. I advised leaving the fragment in

Fig. 28.—Appearance of patient before (left) and after (right) correction of extreme prognathism. The lower jaw was sectioned on both sides in two places and a block of bone removed. The jaws were then wired together for six weeks. The upper lip was then freed and brought forward by cutting it loose from the maxilla, cutting the columella from the septum, and suturing both the lip and the columella forward.

Fig. 29.—Left: Appearance of patient, showing deformity associated with harelip and cleft palate. Right: Appearance after the upper lip and nose were brought forward by freeing them from the maxilla and septum and suturing them forward. Dental compound was employed in place of an upper plate that was not ready at the time the photograph was taken. A crooked nose was fractured and reset, and an open palate was closed.

that position. It could not be palpated, it did not disturb function nor were any other symptoms referable to it present, so that suggestion was finally accepted. In order to overcome the contraction which would take place in that joint, thus affecting proper function, I adjusted a swaged metal splint on the molars of the affected side and instructed the patient to use the left side for mastication, thus insuring the stretching of the structures on the right side every time he closed his mouth in eating. A short time after this appliance was cemented in, he was comfortable, so I allowed it to remain for eight months—probably a longer period of time than necessary—and I found that, after removal, he experienced no difficulty whatever in mastication, both sides of the jaws meeting evenly. Time will tell whether or not stretching of this scar will be entirely satisfactory. I believe it will be, for each time this man eats, he counteracts contraction by the act of mastication.

Fig. 30.—Left: Young girl with lack of development of the maxilla. The occlusion had been restored by orthodontic treatment. Restoration was made by first lengthening the breathing tube by skin flaps taken from the arm and let in through the mouth and an incision in the upper fornix. Right: Final result. A piece of cartilage has been placed in the bridge of the nose.

THE ROLE OF DIETETICS IN THE DEVELOPMENT AND MAINTENANCE OF THE MASTICATORY APPARATUS*

By L. PIERCE ANTHONY, D.D.S., F.A.C.D., Philadelphia, Pennsylvania

WHEN, in 1839, dentistry was formally launched on its career as a specialty of medicine, its claim to being a separate and distinct branch of the healing art was predicated largely upon the proficiency that some few members of the medical profession had developed in the mechanical restoration of the teeth. It was only natural, therefore, that mechanical proficiency should be the dominating motif in its immediate development, and for several decades the attention of the entire profession was devoted almost solely to the reparative and restorative phases, until American dentistry attained a mechanical skill that placed it concededly in the front ranks of world dentistry.

After several decades of progression along this line, and when the heyday of mechanical expertness was practically reached, it became evident that we were little nearer the conquering of dental caries, the *raison d' être* of dentistry, than when we began, and it was realized that to solve the problem of dental disease and to perform our proposed mission to humanity we should have to approach the problem from another angle.

With the advancement of civilization and the consequent changes in food habits, the ravages of decay increased far out of proportion to the physical ability of the profession to cope with it, and this insuperable task directed the attention of a few to a study of the causes of dental caries, in the hope of discovering some means that would enable the profession to deal with the situation more intelligently and effectively.

The medical profession had gone through practically the same experience, devoting its attention almost entirely to the curative phase of medicine, and with comparatively less success. It also became evident to them that in its constantly increasing enormity, the task promised to be overwhelming, and thus it became plain to the thinking members of the medical profession that another method of attack would have to be devised and prosecuted before they could hope to deal effectively with disease.

This trend of thought led to the idea of prevention rather than cure, and the efforts of the medical profession have been directed very definitely toward this phase of medicine for the past few decades, and with conspicuous results in dealing with some heretofore intractable diseases.

It was practically through the activi-

*Read before the Midwinter Clinic of the Chicago Dental Society, Jan. 27, 1926.

ties of medicine and through a realization of the futility of the course then pursued that dentistry was awakened to the necessity of directing its efforts toward the preventive phase of dentistry rather than confining them to the reparative.

The first intelligently conceived plan for the study of our problem from the standpoint of prevention was Miller's[1] now classic work. In this contribution, he sounded the keynote of the future course of dentistry, and although it did not, at the time, attract serious attention from the profession as a whole, it planted the seed which, a decade or so afterwards, has impelled our attention to what Miller recognized to be the future hope of dental science.

Miller's next step toward his laudable goal was a study of the etiology of caries, which resulted in the promulgation of the chemicoparasitic theory, and this, we believe, is the work that has eventuated in concentrating our efforts on the ideal of prevention.

Practically every possibility of the local approach to our goal has been exhausted, until now the researchers in this field are almost unanimous in the belief that to deal effectively with the dental disease problem, we must begin far back of the time when it has become established, and we are now beginning to consider seriously the metabolic process as the *fons et origo* of all dental disease conditions.

A serious study of the present-day prevalence of dental caries has been one of the agencies that have led to the belief that almost all ills of the human body have their origin in the process that has for its functions the promotion of growth, the supplying of energy and the maintenance of bodily functions in the human organism; namely, the nutritional process. But back of this, even, and the *sine qua non* upon which a normal nutritional process is predicated, is the material furnished for the normal functioning of that process; namely, the food which we supply for bodily uses.

Thus, we are led to the central thought and purpose of our thesis, which is to endeavor to show that not only is the development of the masticating apparatus dependent on the proper food supply, but also its life cycle is predetermined by the character of material supplied to the body in its formative stages as well as during its entire functioning tenure.

An almost unlimited amount of research work has been done to prove, and it has been proved without a doubt, that the bone tissues of the body cannot grow and cannot be of proper character to serve their purposes unless they are supplied the constituents required by Nature for development, growth, function and maintenance.

The notable research work of McCollum,[2] McCarrison,[3] Funk,[4]

1. Miller, W. D.: The Human Mouth as a Focus of Infection, Dent. Cosmos, 33: 689 (Sept.), 789 (Oct.), 913 (Nov.) 1891; The Presence of Bacterial Plaques on the Surface of the Teeth, and Their Significance, Dent. Cosmos, 44: 425 (May) 1902.

2. McCollum, E. V., and Nina Simmonds: The Newer Knowledge of Nutrition, New York, The MacMillan Company, Ed. 3, 1925.

3. McCarrison, Robert: Studies in Deficiency Disease, New York, Oxford University Press, 1921.

4. Funk, C.: The Vitamines, Baltimore, the Williams and Wilkins Co., 1922.

Lusk,[5] Osborn[6], Hess, Mendel,[7] Grieves,[8] Mellanby,[9] Bunting,[10] Seccombe,[11] Hartzell and Larson,[12] Marshall[13] and a host of others too numerous to mention has placed dietetics on a solid scientific foundation where it can be definitely utilized in the realization of the goal of dental disease prevention.

Among these, Mellanby, Grieves, McCollum, Howe,[14] Bunting, Seccombe and Marshall have devoted much attention to the relation of food to the formation of tooth structure, and it shall be our effort here to endeavor to show the practical application of their work to the objective of dental practice—the maintenance of the masticatory apparatus at its normal functional efficiency.

Dietetics may be broadly defined as the science of the study of food in its relation to the nutritive functional processes of the body in health and in disease. The function of the nutritional process is to supply energy to the organism, to build and repair tissue and to regulate the body activities from the food supplied.

This, then, is the metabolic process of the body, the story of which is as absorbingly interesting as any romance ever written even more so, as it concerns our own self; and what study could be more interesting to mankind than the study of man?

An even broader conception of dietetics is not only that it is concerned with the sustenance of life, the promotion of growth and the maintenance of health, but also that faults therein may be responsible for deviations from health.

The cardinal principle upon which modern curative medicine is based is that any bodily ill must be corrected at its source; hence, the nutritional function becomes the foundation stone upon which the structure of preventive medicine and dentistry must be built.

It was Hunter's[15] castigation of so-called American dentistry that compelled an introspective study of dental procedures, which eventuated in a revo-

5. Lusk, Graham: The Science of Nutrition, Ed. 3, Philadelphia, W. B. Saunders Co., 1925.

6. Osborne, R. B., and Mendel, L. B.: Amino-Acids in Nutrition and Growth, J. Biol. Chem., 49: 325, 1914.

7. Mendel, L. B.: Nutrition and Growth, J.A.M.A., 64: 1539, 1915.

8. Grieves, C. J.: Effect of Defective Diets on Teeth, J.A.M.A., 79: 1567 (Nov. 4) 1922.

9. Mellanby, E.: Deficiency Diseases, with Special Reference to Rickets, Brit. M. J., 1: 895 (May 24) 1924.

10. Bunting, R. W.: Prenatal Feeding with Special Reference to Bone and Tooth Development, J.A.D.A., 11: 554 (June) 1924; The Experimental Production of Dental Caries in Animals, Dent. Cosmos, 67: 771 (Aug.) 1925.

11. Seccombe, Wallace: Diet in Relation to Oral Hygiene, J.N.D.A., 8: 441 (June) 1921.

12. Hartzell, T. B., and Larson, W. P.: Further Studies of the Etiology of Dental Caries, J.A.D.A., 12: 784 (July) 1925.

13. Marshall, J. A.: Changes in Tooth Structure Resulting from Deficient Diets, J.A.M.A., 81: 1665 (Nov. 17) 1923.

14. Howe, P. R.: Decalcification of Teeth and Bones and Regeneration of Bone Through Diet, J.A.M.A., 79: 1565 (Nov. 4) 1922; An Account of Progress in Dental Dietetic Research, Dent. Cosmos, 68: 33 (Jan.) 1926.

15. Hunter, William: The Rôle of Sepsis and of Antisepsis in Medicine, Dent. Cosmos, 60: 585 (July) 1918.

lution of thought in dentistry. As a result of that introspective study has come the realization that practically all of our methods of procedure have been conceived and prosecuted without regard to the biologic phase, and, as a natural consequence, we have developed a myopic vision of the broad aims and purposes of dentistry.

Added to the quite generally acknowledged therapeutic *faux pas* in the field of crown and bridgework, so forcibly brought to our attention by Hunter, comes the almost universal conviction that our efforts to cope with pulpless teeth have been an almost equally colossal failure, both therapeutically and biologically; so much so, that an increasing number of the profession are advocating the removal of all pulpless teeth and the abandonment of all efforts to save them.

While we are not at all in agreement with such radical views, and still believe that a large proportion of pulpless teeth can be made serviceable organs that are not a constant menace to the health of the individual, we are mainly concerned with that phase of dental procedure here in its bearing on the broad question of preventive dentistry.

If we accept the view that the pulpless tooth is a potential menace to bodily health, it becomes all the more necessary that our efforts be directed to preventing this condition; for the acceptance of that view connotes the acknowledgement that one of the most important phases of corrective dentistry has failed of its object.

Miller's work, confirmed by Black,[16] and, more recently, apparently confirmed by Bunting, refers the question of caries to environmental conditions of the mouth in that the bacterial flora of the mouth is the determining factor in the etiology of acid fermentation, which is responsible for caries. And this leads us back to the systemic phase, which is responsible for the environmental conditions that are conducive to caries.

THE THREE FOOD ELEMENTS

There are three characters of food that comprise the dietary of the human being, namely, carbohydrates, proteins and fats, from which the body derives the fifteen elements necessary for the tissues of the organism, and in addition thereto, there are certain accessory food factors known as vitamins, which of late have been discovered in the various kinds of foods and which play an important part in the nutritional process.

The purpose of carbohydrate foods is primarily to furnish energy to the body. The protein food elements supply material for the building of tissue proteins; the fats, for supplying energy and building tissue; and the latter, in combination with proteins, enters into the chemical formation of the complex substances of cellular protoplasm and cell membrane of the central nervous system.

Through the wonderful inherent protective and preservative forces of organic life, the metabolic process is capable of converting both proteins and fats into carbohydrates and also converting carbohydrates and proteins into fats, evidently as a means of supplying a deficiency in a particular character of

16. Black, G. V.: An Investigation of the Physical Characters of the Human Teeth, Dent. Cosmos, 37: 353 (May) 1895.

food. This conversion of foods seems primarily intended by Nature as a preservative measure for the purpose of maintaining the life of the organism by providing, even though imperfectly, for some of the main body functions, and apparently does not provide for normal natural growth of the organism. Thus is graphically shown one of Nature's provisions for the preservation of the species.

The proteins are converted in the nutritional process into the amino-acids so often referred to, yet so vaguely understood. Briefly, these are chemical substances produced from the proteins, and in this form the protein material is taken into the blood for the production of energy and tissue building.

It may then be logically deduced that an improperly constituted diet, deficient in any one of these three characters of food, may readily be responsible for inferior physical development, instability of the nervous system, lack of endurance and lack of recuperative power, and may be responsible for a cumulative fatigue, with a consequent lack of resistance to infectious diseases. Added to this may be an increased rate of development of senile characteristics, and thus length of life itself may be readily influenced by the type of diet consumed.

While it has been pretty clearly shown that the bacteria which produce acid fermentation and which are responsible for caries, can and do flourish in an environment of pasty carbohydrate foods, we believe the most significant fact to be noted is the doubly harmful effect of the excess of carbohydrates, in that it may express itself both locally and systemically.

With regard to the contention that carbohydrate food is an important factor in the prevalence of caries in children, we do not believe that it is particularly the character of the food *per se* that is responsible, but that an excess of this character of food, as of any of the others, may be responsible for the general unbalance in the dietary which may and does cause disturbance in the metabolic process, with all of its sequelae.

As intimated above, the dietary habits of the more highly civilized peoples in America and Europe have undergone material changes in the past few decades, and Nature, ever facile in the faculty of adaptation, is endeavoring to adapt herself to these dietary changes. In the meantime, we are paying a heavy toll for the experiment, for all the available information seems to indicate that the prevalence of malnutrition among school children, faulty and deficient bone growth, malposed and defective teeth may be attributed to an inadequacy in the national dietary and to perverted and abnormal food habits.

RICKETS AND TOOTH DEVELOPMENT

It is interesting to note that the investigative work done on rickets, one of the most prevalent diseases among ill-nourished children, has led to a better understanding of the bone-forming processes and incidentally paved the way for the discovery of the accessory food factors known as vitamins.

It has also stimulated the investigation of the process by which the structures of the teeth are formed, and gives hope

of much knowledge to be gained in the nutritional field generally and of particular interest to dental science.

Rickets, essentially a developmental disease, appearing in children at the most critical stage, has been found to have a close relationship to faulty tooth development, which occurs early in childhood.

As the calcification of the first set of teeth begins in the fourth or fifth month of pregnancy and that of the permanent molars in approximately the last three months of prenatal life, the character of the teeth of the child is determined before birth. It is during these last three months of fetal life that physiologists claim that practically one-third of the mineral salts contained in the skeletal structure are deposited in the bones of the fetus. Mellanby has shown definitely that development of bone structures of the teeth and jaws of the dog can be materially influenced by the diet in the stages of fetal life.

The fetal life, then, without doubt establishes itself as the most critical stage in the development of the masticatory apparatus; which unfortunately is, at present, beyond the purview of the dentist, this fact alone making it more incumbent on both medical and dental men to establish a closer relationship of their work, if preventive medicine is ever to be attained.

The next most important stage in the formation and development of the teeth is the period of lactation, for it is during this period that the formation and development of the larger portion of the two dentures occur.

The research workers already referred to have shown conclusively that the structure of the bone tissues of the jaws and the teeth is and must be determined by the character of the diet in the formative period of these organs. Since the formative and developmental periods occur for the most part during gestation and lactation, it is not only necessary that the mother receive proper nutriment during the period of gestation and lactation, in order that calcium and phosphorus metabolism be controlled, but also that the food of the child be chosen with a view to supplying the materials which have been determined as the most important in the building of the bone and tooth structures.

Studies have been made by Hellman[17] to show the difference in the structure of the teeth and bones of breast-fed and of bottle-fed infants, and a further study of this question by Lusk has led to the conclusion that the determining factor lies in the character of food the mother receives during the period of lactation.

CALCIUM METABOLISM

As calcium metabolism appears to be the most profound influence in the calcification of the teeth and bone tissues, and as this is so closely related to the formation and development of the teeth during the periods of gestation and lactation, we shall refer briefly to the present status of knowledge on this subject.

Hess and Unger have shown that the nursing infant accepts calcium more readily through the mother's milk than

17. Hellman, Milo: Nutrition, Growth and Dentition, Dent. Cosmos, 65: 34 (Jan.) 1923.

in any other form, and Ferguson[18] states that the diet of the mother is of fundamental importance in determining her capacity to produce milk of a good quality. McCollum has shown that calcium is absolutely essential to normal bone production, and that its deposition is materially influenced by vitamin D. Funk suggests that vitamin A is the controlling factor in calcium metabolism. These statements are easily reconciled since it has been determined that the original vitamin A really comprises two separate accessory food factors, the second of which seems to be particularly related to calcium metabolism, and which McCollum has called vitamin D.

As further evidence of the importance of calcium metabolism, it has been pretty well shown that calcium in the mother's diet is a most important element in determining the production of milk in the mother, and an insufficiency in the mother's diet will draw from her own supply in the tissues, or result in a deficiency of this element in the milk furnished the infant.

This, I believe, readily accounts for numerous clinical observations which indicate that the teeth of the mother suffer materially as the result of pregnancy, as embodied in the folkloristic adage "a tooth for a child," although in many instances the proportion is much greater.

Another phase of the question of the relation of the development of the bones of the jaw to the fetal period, and one which we have never heard emphasized in any discussion of the subject, is that the mandible is the first bone of the fetal skeleton to begin calcification. Thus, it may be seen how critical this period is in the developmental and formative stage of the entire masticatory apparatus.

As a side light on the prominence which cod liver oil has received as related to rickets and bone formation, and which has led to its general advertisement as a panacea for such evils, McCollum believes, as the result of his own work and that of his collaborators, that cod liver oil does not regulate inorganic metabolism but permits the regulatory mechanism of the body to operate with increased efficiency and economy.

FOOD HABITS OF DIFFERENT RACES

The influence of the diet on the structure of the bones has received much attention also from the standpoint of the study of the food habits of the various races and of the primitive races. A study of the food habits of the primitive races is most convincingly in favor of the belief that the character of the food is quite closely associated with the absence or presence of dental disease. Such a study also furnishes graphic proof of the ability of Nature to adapt herself, within limitations, to the natural food conditions, and this offers further explanation of the inherent power of the nutritional mechanism to convert one character of food into another to meet Nature's needs.

Our present dietary habits have been characterized by one prominent worker

18. Ferguson, M.: A Study of Social and Economic Factors in the Causation of Rickets, Rep. Med. Res. Council, London, October, 1917.

in this field as one of the most colossal errors of civilization and have served to recall attention to the importance of scientific nutrition as an aid to preventive medicine.

Hrdlicka, as the result of his study of the food habits of the Eskimo, says that owing to his diet, food habits and environment, the bones of the Eskimo of northwestern Greenland are remarkably developed and that the teeth of the Eskimo are, as a whole, probably the best of all large groups of people living today.

Leigh[19] has also made an exhaustive study of the jaws and teeth of the Eskimo and his conclusions are in accord with those of Hrdlicka. Both report absolute absence of rickets in the children of the Eskimo, and it is now well known not only that rickets is an indication of faulty bone development but also that its presence makes the child more susceptible to diseases that may affect the development and growth of the teeth.

There are other factors that enter into the development of the masticatory apparatus, such as the function of mastication, the proper functioning of the endocrine system, function in its relation to development, heredity and environment, infectious diseases of childhood, fatigue, exercise and the character of the salivary fluids, but these are all fundamentally related to and dependent on the broad question of dietetics.

MAINTENANCE

As the question of the maintenance of the masticatory apparatus is more dependent on the presence or absence of dental caries than any other one condition, we shall devote our attention more particularly to the relation of this condition to the metabolic process.

We have referred previously to the classic work of Miller when he presented the chemicoparasitic theory of dental caries, which was the pioneer effort in this field. Black and Williams[20] confirmed his findings, and, in recent years, notable work has been done in this field by Bunting, Howe, Toverud,[21] Grieves, Hartzell and Larson, Marshall, Kirk,[22] Mellanby, Broderick,[23] Pickerill,[24] McCarrison, Rodriquez,[25] Goadby,[26] McIntosh, James and Lazarus-Barlow,[27] Bödecker,[28] Gies,[29] Klig-

19. Leigh, R. W.: Dental Pathology of the Eskimo, Dent. Cosmos, 67: 884 (Sept.) 1925.

20. Williams, J. L.: A Contribution to the Study of Pathology of Enamel, Dent. Cosmos, 39: 169 (March), 269 (April), 353 (May) 1897.

21. Toverud, G.: Influence of Diet on Teeth and Bones, J. Biol. Chem., 58: 583 (Dec.) 1923.

22. Kirk, E. C.: A Reconsideration of the Etiology of Dental Caries, and a New Theory of Caries Susceptibility, Dent. Cosmos, 56: 1 (Jan.) 1914.

23. Broderick, F. W.: Effect of Endocrine Derangement on the Teeth, Dent. Cosmos, 63: 135 (Feb.) 1921.

24. Pickerill, H. P.: The Prevention of Dental Caries and Oral Sepsis, Ed. 2, New York, Paul B. Hoeber, 1914.

25. Rodriquez, F. E.: Studies in the Specific Bacteriology of Dental Caries, Mil. Dent. J., 1922, p. 199.

26. Goadby, K.: Mycology of the Mouth, London, Longmans, Green & Co., 1903.

27. McIntosh, J.; James, W. W., and Lazarus-Barlow, P.: Etiology of Dental Caries, J. Exper. Pathol., 3: 138, 1922.

28. Bödecker, C. F.: A Consideration of Some of the Changes in the Teeth from Youth to Old Age, Dent. Cosmos, 67: 543 (May) 1925.

29. Gies, W. J., et al.: Further Nutritive Studies of Dentition, J. Allied Dent. Soc., 11: 47, 1916.

ler[30] and others, the sum total of which has been to confirm Miller's findings and to discover what is apparently the bacteria responsible, at least in large degree, for the carious process.

Mellanby,[31] as the result of experiments on dogs, arrives at the conclusion that a diet deficient in the vitamin substance which promotes the deposition of calcium and phosphorus in the bone structure, and which is also reflected quite definitely in the character of dentin formed, lowers the resistance of the animal to bacterial and other diseases. She explains the often observed phenomenon of more stable and less carious conditions in the incisor teeth than in the cuspids and molars on the basis that the larger proportion of the dentin of the incisors is laid down before birth and at a time when the mother can and does sacrifice her own stores; whereas, in the cuspids and molars, the greater portion is formed without aid from this source. She further says that recent research appears to confirm Miller's theory, but that this phase of the question is comparatively unimportant when the teeth are perfectly formed and the diet remains good after eruption; which we interpret to mean that Nature will take care of the carious process if the teeth are perfectly formed and the diet is as it should be after tooth formation.

Bunting, from another but related point of view, concludes that mouth conditions may be so influenced by a disturbance in the nutritional process as to permit bacteria to attack the teeth, and that through this avenue an unbalanced diet may be responsible for caries.

The environmental conditions of the mouth and the bacterial flora are definitely related to and dependent on the nutritional process, and the nutritional process that will produce sound and perfectly formed teeth necessarily connotes an environmental condition and a bacterial flora that would be most favorable to the preservation of the teeth.

It is only upon the chemicoparasitic theory of Miller, and in consideration of the part played by diet in the environmental conditions of the mouth, that we can explain the oft-observed phenomenon of immunity to caries in an obviously filthy mouth.

Mellanby, Howe, Marshall, Toverud, Höjer and Westin,[32] and Grieves have shown how materially the tooth structures may be affected by diet. Marshall has thus produced teeth almost lacking in dentin, although with normal enamel. Howe and Toverud produced changes in teeth after formation, as well as periodontal disease, and corrected defects thus produced, both by means of the diet. Howe, with Mellanby, thinks Miller's theory of caries is secondary to metabolic changes.

Hartzell and Larson, while in disagreement with the acid theory of

30. Kligler, I. J.: A Biochemical Study and Differentiation of Oral Bacteria with Special Reference to Dental Caries, J. Allied Dent. Soc., 10: 141, 1915.

31. Mellanby, May: Experimental Evidence Demonstrating the Influence of a Special Dietetic Factor on the Development of the Teeth and Jaws, Dent. Rec. 40: 63 (Feb.) 1920; The Relation of Caries to the Structure of the Teeth, Brit. D. J. 44: 1 (Jan.) 1923.

32. Höjer, A. and G. Westin: Jaws and Teeth in Scorbutic Guinea-Pigs, Dent. Cosmos, 67: 1 (Jan.) 1925.

caries, and inclined to the belief that there is developed in the tooth structure an inherent resistant force to caries, conclude that caries is the result of several interdependent factors, among which bacterial activity and "predisposed" teeth are the most important.

Grieves is firm in the belief that dietary deficiency is definitely associated with the occurrence of dental caries, and that proper dietary relationship of calcium and phosphorus, together with the presence of vitamin D, are most important factors in the formation of the teeth and supporting tissues.

There are other and numerous phases of this momentous problem that could be dwelt on almost indefinitely, but I believe that I have presented ample and sufficient evidence to warrant the conclusion that the development and formation of teeth, as well as their maintenance, is conclusively and essentially a dietary problem; that deviations from the normal have their origin in the nutritional process, and that the proper functioning of this process is mainly, if not wholly, dependent on the character of food material supplied to the body.

DISCUSSION

Thomas B. Hartzell, Minneapolis, Minn.: Dr. Anthony's paper is a serious and well-grounded effort to prove that the development of the masticatory apparatus is dependent on a proper food supply and that its life cycle is predetermined by the character of material supplied to the body in its formative stages as well as during its entire functioning tenure. He brings out forcibly the fact that the food and nutritional processes of the mother determine to a large degree the character of the body of the child. He draws particular attention to the fact that the jaws are among the first members formed in the fetus, and his conception of the science of dietetics is that not only is it concerned with the sustenance of life, the promotion of growth and the sustenance of health, but that faulty dietetics may be responsible for all deviations from health. One might reasonably conclude, from a study of Dr. Anthony's thesis, that a correct dietetic regimen would eliminate disease. In other words, that the child produced under ideal dietetic conditions of the parent must, of necessity, have a perfect body, and that if the dietetic regimen of the child from birth on be correct, disease can gain no foothold. He stresses the possibility that an excess of carbohydrate food, as well as any other, may be responsible for the general unbalance in the dietary, which may and does cause disturbance in the metabolic processes. He states that we are paying a heavy toll through malnutrition among school children for deficient and faulty bone-growth, and, particularly, malposed and defective teeth, permitted to occur by perverted and abnormal food habits. I am in full accord with these broad principles. I am also in accord with Dr. Anthony in desiring that medical and dental men establish a closer relationship of their work, to the end that prospective mothers may be guided to select a diet that will give proper nutrition during the period of gestation and lactation, that calcium and phosphorus metabolism may be ideal; and also that the food of the child be chosen to supply the material which we know to be important in the building of bone and tooth structure. He supports his thesis by the work of Hellman and Lusk, to the conclusion that the determining factor lies within the mother, in the character of food she receives during the period of gestation; and he emphasizes the fact that this food supply must be correct from the very beginning, because of the fact that the mandible is the first bone in the fetal skeleton to be formed. He also emphasizes the fact that there are other factors that enter into the development of the masticatory apparatus, as the function of mastication, the proper functioning of the endocrine system, the occurrence of the infectious diseases of childhood, fatigue, exercise, the character of the salivary fluids, and again states that these are all fundamentally related to and dependent on the broad ques-

tion of dietetics. It is indeed unfortunate that the ideal dietetic conditions outlined by Dr. Anthony cannot be enjoyed by the whole human race; and it is unfortunate that the few who experience fundamentally good conditions of life do not always prove his thesis. To illustrate: An individual developed prenatally under ideal dietetic conditions of the expectant mother and sustained in later life under ideal dietetic conditions should be free from all disease. Such a one should be so well equipped to resist disease that bacteria could gain no foothold in the body, because its tissues and fluids would repel and destroy them. Dr. Anthony draws on the work of Mellanby for a reason for what he alleges to be the more stable and less carious condition observed in the incisors than in the cuspid and molars; i. e., that they are laid down first in the formation of the fetus, thereby receiving their nutriment and building their structure before birth, at a time when the mother can and does sacrifice her own stores; whereas the cuspids and molars are formed without the aid of this store, and that Nature will take care of the carious processes, if the teeth are perfectly formed, and the diet is as it should be after tooth formation. While all these conclusions seem to be logical, I wish to emphasize the fact that caries of human teeth begins by and through the destruction of the enamel. It matters not what the structure of the dentin may be. Marshall has shown that the dentin may be very defective and the enamel coat seem to be normal, so that while logically the question of diet should be and is of tremendous importance, the factor of bacterial attack is of still greater importance, and, until we learn how to prevent bacterial attack, we shall not have solved our problem. I repeat that all caries begins on the enamel surface. Not a single line have I been able to find in any book or publication to disprove this assertion. I freely admit and I believe that an individual nourished under ideal conditions can and does oppose bacterial activity with greater facility than the ill-nourished individual. And, an ideal diet after the teeth have erupted becomes valuable only in proportion as it enables the blood and tissues of the individual to resist bacteria; for it is bacterial action first, last and all the time that breaks down enamel. If the dentin beneath the enamel is poorly formed, bacterial invasion may go on more rapidly than it would if the dentin tubules were well-formed with comparatively few interglobular spaces in the dentin. The ferments of proteolytic bacteria-creating alkalis can and do injure the enamel rod, and the acid excrement of those bacteria that ferment carbohydrates which make lactic acid do soften the ends of enamel rods. Their presence, long enough continued, results in the destruction of them, thus opening the dentin to penetration. Seibert, Kantorowitz, Niedergasass, Goadby, Black, Henrici and others give testimony to the fact that the streptococcus penetrates dentinal tubuli far in advance of the decalcification of the tubules; and until we learn how to prevent and oppose this bacterial penetration, we must still exercise our skill and ingenuity to prevent the accumulation on tooth surfaces of masses of bacteria sufficient to furnish enzymes and irritating acids and alkalis enough to break down the hard tissues. And, while in full accord with the principles set out in this paper, my brief message is that the bacteria which break down tooth surfaces have the power to double their number every half hour, and that teeth may, by a thorough scouring of all the surfaces, be rendered so nearly free from these bacteria that there is not enough of them to attack, and disclosing stains will not reveal macroscopic masses. A repeated study of the problem of the increase of bacteria on tooth surfaces shows that after such an ideally effective tooth cleansing as I have just mentioned the teeth remain sufficiently free from bacteria to prevent their destructive action up to the fifth or sixth hour. Therefore, my advice, and my own practice of prophylaxis, lead me to believe that three thorough scourings a day are none too many, and that, in addition to this scouring action, removing the bacteria from the necks of teeth and their contact surfaces as well as all the other exposed surfaces is greatly aided by incorporating in the scouring vehicle not less than 2 per cent of sodium ricinoleate, which neutralizes or detoxifies the bacterial ferments and poisons which are active in destroying enamel. Let us cooperate with each other and with the medical profession to the end that dietetics be prac-

ticed in the broadest and most effective way possible, but do not lose sight of the fact that the greatest good to the greatest number will be experienced by those who combine dietetics and mechanical and chemical preventive measures. I am certain that Dr. Anthony's thesis is fundamentally correct, and, doubtless, here and there are individuals so nearly perfect in the practice of correct dietetics that the matters which I have discussed become unimportant. For the great majority of the human race at the present time,' however, a combination of dietetics and prophylaxis is absolutely essential to the greatest success.

We must have correct food to build ideally perfect structures, and to create and maintain a maximum resistance to pathogenic bacteria. The principal difficulty in accepting dietetics as the chief and only remedy for all disease, and dental disease in particular, is that we have as yet no certain knowledge as to just what constitutes a diet that can be depended on to make possible complete freedom from disease.' The only mass example noted by Dr. Anthony in his thesis is that mentioned by Hrdlicka as a result of his study of the food habits of the Eskimo. Hrdlicka says that, owing to diet and food habits and environment, the bones of the Eskimo of northwestern Greenland are remarkably developed and the teeth of the Eskimo as a whole are probably the best of all large groups of people living today. My impression as to the diet and food habits of the Eskimo has been gained through contact with Donald D. McMillan. He has recently thrown much light on the subject by his public lectures and by the exhibition of his motion pictures of these Eskimos of northwestern Greenland as he came in contact with them during his expedition of last summer. He shows them eating raw flesh and raw eggs of birds, which they catch in great numbers by the means of hand nets, during their flight. These birds, frozen, and the flesh of the walrus provide the major portion of their diet, which is principally eaten raw. Green vegetables, fruits and milk are practically unknown among them. Since it is quite impossible to provide the Greenland environment for any great number of our people, and since it is further quite improbable that any sort of argument could induce a considerable number of our patients to adopt raw flesh as a diet, I cannot see that we gain much help from observations regarding the Eskimo; and, my own belief is that our research workers in dietetics must not only work out dependable diets that are acceptable to the people but they must also prove their value by concrete mass examples, demonstrating a direct and positive ability to check mouth diseases, particularly caries and pyorrhea, if we are to expect any great benefit to accrue to the human race from this teaching.

AN ORTHODONTIC OUNCE OF PREVENTION*

By BURT ABELL, D.D.S., Toledo, Ohio

"AN ounce of prevention is worth a pound of cure" should be the slogan of every dentist, of every orthodontist in the world. He should believe it, practice it, teach it on every and all occasions, to patients present and prospective, but particularly to parents. We meet, confer, study, experiment, in every way possible endeavor to equip ourselves for greater efficiency in our profession, but our field is largely limited to our four walls and our practice to people dentally defective. In discussing this matter with me last year, my dentist made a remark that I should like to take for my text in this rather simple talk today. He said, "I'm getting tired of this everlasting patching and repairing—but what are we going to do about it?"

After thirty-three years spent at a dental chair, twenty-two of which have been devoted to the orthodontic care of children's teeth, I find the profession is still unable to answer this question fully; a question that must have forced itself on thoughtful men almost from the beginning. We've been so busy with reparative measures that we have not thought through our problem to what the business man would call "the ultimate consumer." We've visioned the heaven of perfect dental equipment and climbed our ladder to the skies, only to find it fall short—at the top, shall we say? No, I believe at the very foundation. To change the figure, we've found an overwhelming flood of deformities and decay sweeping over humanity and have sought by public propaganda to stop it half way up the stream when we should have made every attempt to dam it at its source by personal instruction of the one largely responsible, and most vitally interested—the mother. Instinctively, she is ready to do anything for the welfare of her child, if she can have the way pointed out to her. Mass instruction in school and school reports carried home by the child, magazine articles on care of teeth, diet, etc., all have helped, and are helping today, but they are too general to be most effective. They lack the personal touch that the orthodontist, the dentist and the physician can give. To give this instruction, I believe it is the privilege—nay, the duty—of every orthodontist or dentist to call in for inspection and advise the mother and all of her children under 10 years of age in every family, any member of which, mother, father or child, he has for a patient, in order that the mother especially may be instructed

*Read before the Section on Orthodontia and Periodontia at the Sixty-Seventh Annual Session of the American Dental Association, Louisville, Ky., Sept. 24, 1925.

in the growth and care of the children's teeth and the surrounding tissues.

It is not my intention to lead you to forget any present standards of professional ethics, but rather to enlarge your vision of the basis of all ethics—the science of human duty, the bringing of the greatest good to the largest number. To support my position, I quote Dr. Ottolengui: "The professional man is ever forgetful of himself when to consult his own interests would be to ignore those of his patients." Many of us can remember when it was considered unethical even to remind a patient, by phone or letter, of the time of an appointment. Today, the patient expects it and feels that he is not properly cared for unless this is done. Coordinating public and professional appreciation of professional ethics demands more and more that the better educated assume the responsibility. This is as it should be. Let us broaden our standards of practice to measure up to the responsibility which is thus ours and educate the mother until she shall be equipped to bear her share.

Because his patients are mostly children, who are often accompanied by the mothers, and because he is thus nearer the headwaters of the stream of defects, the orthodontist is peculiarly situated to recognize anomalies and discover the etiologic factors. Thus, there lies heavily on him the responsibility to institute remedial propaganda. In doing this, he will find the dentist particularly responsive and willing to assist. He will be only too glad to have presented to him the anomalies of occlusion, which, in a busy practice devoted almost exclusively to repair and substitution, he has assumed belonged to the orthodontist. As a rule, he has taken it for granted that, when he has recognized the grosser forms of malocclusion and referred the case to the specialist, the claims of conscience in the matter have been satisfied. I have found that when his ear and the eye have been interested, he has responded with a request for a list of the things to be looked for and talked about to the mothers in his clientele.

In these days of specialization, it is becoming increasingly easy to pass on the responsibility to the next man, until the patient often becomes wearied and disgusted. Anywhere along the line, the one who demonstrates a broad and fundamental understanding of the case earns and secures the gratitude and allegiance of the patient. The orthodontist, in his propaganda for the removal of the causes of malocclusion, will find this an argument to which the dentist readily responds, to the mutual advantage of all concerned.

In his efforts to check malocclusion and decay, the orthodontist will find the parent-teacher clubs an efficient avenue of imparting information. Careful elimination of technical terms and illustrated results of one's own work must be rigidly adhered to here. Basic causes, with progressive steps to ultimate deformities, are readily understood, when illustrated, and lead to definite action on the part of the parents. Almost without exception, they consult their dentist first, and he should be instructed and fortified to answer their inquiries.

Once let it become known, in any ethical way, that you have something fundamentally and constructively helpful, and the dentists will afford you

abundant opportunity to present it to them.

Prints of a few of the slides that I have been using recently in dental meetings are presented herewith (Figs. 1-13).

Fig. 1.—Skull showing close approach to normal occlusion.

The *secretum apertum* (Fig. 1) is held up as an ideal and good to have in mind even in the care of the temporary teeth. In the report of the fourth meeting of the American Society of Orthodontists, Dr. Angle shows even better examples of normal occlusion from the Broomell, Turner and Cryer collections. (Fig. 1.)

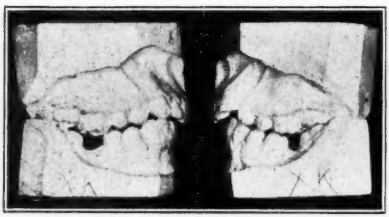

Fig. 2.—Cast showing malocclusion for which the early extraction of the lower first permanent molars was responsible.

Figure 2 I use as an example of the loss of the first permanent molars,

Fig. 3.—Cast of case in patient, aged 12 years, with broken down molars and distoclusion, the result of the mother's ignorance.

sketching the progress of the case from the first evidence of decay to the present condition. You may have even better ones you can use. These cases are so common the dentist is in danger

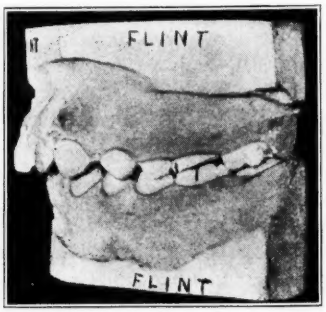

Fig. 4.—Cast of case of faulty filling in the upper left first permanent molar, causing malocclusion, for which the dentist was responsible.

of forgetting the importance of these extractions as regards normal occlusion.

Figure 3 illustrates the need of the mothers being instructed. The mother in presenting this case, said to me, "I can't blame anybody but myself for the destruction of these molars. I supposed they were temporary and didn't take the boy to the dentist." She was having her own teeth filled by one who, had he asked her about the children, could have called the boy in, recognized the condition, saved the teeth and advised her regarding the distal and infra-occlusion, provided he himself had been instructed therein by his orthodontist. Following the chain of those responsible leads us to the door of the orthodontist. The widespread ignorance of the mothers on these matters is appalling.

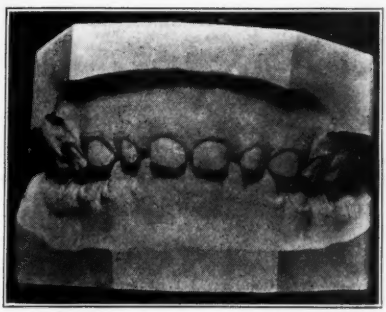

Fig. 5.—Model showing proper spacing of temporary teeth at 5½ and 6 years.

Figure 4 illustrates, for the benefit of all concerned, the effects on the occlusion of the inclined planes, when the hand of man fails to follow Nature's plan—a pertinent picture when the orthodontist is discussing with the dentists the first permanent molar. Mothers as a rule do not know, and dentists often forget, that, at from 4 to 6 years of age, the growth of the bone should separate the temporary teeth, as in Figure 5.

How often have you heard the mother say, "I don't see why these teeth are so irregular—the baby teeth were so even and pretty." Now, let us teach her, by personal instruction or by way of her dentist, what is there in the jaws, showing her pictures like Figure 6, so that she may watch for the proper separation of the teeth in her younger children and prevent malocclusion as much as possible.

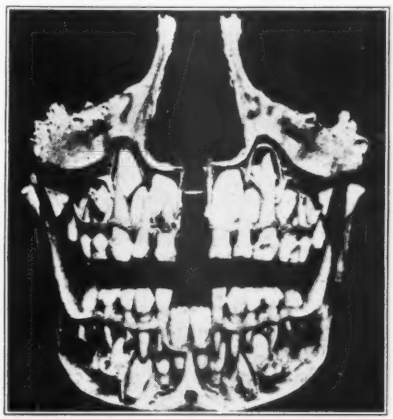

Fig. 6.—Jaw bones showing the necessity for expansion to allow for eruption of the permanent teeth. (After Haskell.)

Fig. 7.—Model showing the effect of thumb sucking.

I have been in many offices where the Haskell Laboratory charts, from which this was taken, are nicely framed and hang on the wall. How many of you have ever called the attention of the mothers who sit in your chair to the interesting matters portrayed there, which, if once grasped, would start them to investigating the conditions in their own children's mouths? And when they bring their children in, what an opportunity you have to discover the results of unrecognized habits of lip and tongue, etc., that are wrecking the occlusion and facial lines. Just by the way of illustration, you may find a case presented where you can point out not only the malocclusion resulting from thumb-sucking, as in Figure 7, but that the lip sucking illustrated in Figure 8 causes a thickening of the lower lip that is persistent and permanently mars the features after the correction is made, as in Figure 9.

Fig. 8.—Appearance of patient whose lower lip was thickened by repeated contacts with the protruding upper teeth.

Fig. 9.—Patient shown in Figure 8. The lip is still thick after several years, although the teeth are in normal occlusion.

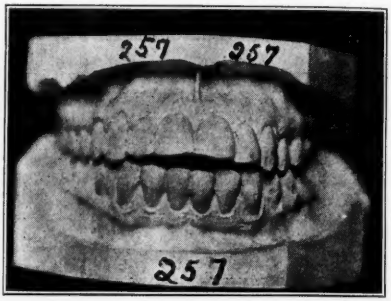

Fig. 10.—Model showing the effect of lip sucking.

Fig. 11.—Patient with chin deflected to the left from the habit of resting the chin in the palm of the right hand.

You can rest assured that the mother

will see to it that the younger children do not develop this habit. Or you may find something like Figure 10, the result of lip and tongue sucking that she never would suspect.

Figure 11 shows an interesting case in which the contributing factor was discovered by accident. The young lady had the somewhat common habit of resting the chin in the right palm and the elbow on the table. Figure 12 shows the effect on the occlusion.

Fig. 12.—Model showing the effect on the teeth of the habit described in Figure 11.

These examples are only suggestive to you, but rest assured, should you conscientiously and persistently attempt to educate the mothers concerning dental anomalies, a host of pernicious habits will appear, which, discovered in time, may lead to much more than an ounce of prevention.

There is one phase of malocclusion that hangs so heavy on my heart that all the rest seem almost child's play. It bulks so large, in all its stages, in my practice that, I must confess, it has become almost a nightmare to me and is really what has led me to believe, and practice and preach that the ounce of prevention is to treat these cases, as much as possible, in the incipient stages, and the one way to get at them early is through the instruction of the mother.

I had taken a little girl through long years of persistent thumb-sucking and had helped her brother to develop from a poorly nourished boy of 6 to a robust virile 12 year old, so a little while ago I called up the mother and said, "Would you mind bringing in the little sister—you had better check up on the condition of her mouth." "I don't

Fig. 13.—Case of infraclusion at 5 years, not recognized by the mother.

think there is much the matter with her," came the reply, "but we'll do anything you say." Figure 13 shows what we found. I must confess it was something of a shock to me. Picture this case five years from now had the infraocclusion not been discovered. Is there any better time to stimulate vertical development than right now, just as the first permanent molars are erupting and should have every opportunity given them to erupt to their fullest height largely determining the length of the overbite? Knowing how ready the mother was to give her children a perfect dental equipment, could I have forgiven myself had I failed to ask her to bring this child? The mother,

on her own inititative, brought in a younger child, 4 years old, and I had the joy of showing her how perfectly the little jaws were developing and the teeth separating—much to the mother's satisfaction.

I am not going to digress with any discussions of treatment or etiology concerning infraocclusion. That all belongs in another chapter, but with all the emphasis possible I say, "See the child early." Unless you do, some will never be helped. Some will struggle through hard years of retention that does not retain. Some will become patients of the periodontist, and to relieve the traumatic stress of vertical mastication, he will grind here and there, in a vain effort to give relief. Some will come to the exodontist and the prosthodontist, because you, the orthodontist, did not see them early.

Some of the matters that I have presented here are common and homely in the extreme—so common that we are liable to forget that they are fundamental, so much so that to forget or disregard them in our practice, but perpetuates the evils of malocclusion and dental destruction infesting the race; while to heed them will go far toward finding a remedy.

My main point is: the educating of the mother, who has been, so far, the neglected point of contact in our efforts to prevent malocclusion and decay. Surely, her grateful appreciation and the warm satisfaction of having been of service will be a reward valued by any dentist or orthodontist who will seek conscientiously to instruct her.

DISCUSSION

Oliver Wilson White, Detroit, Mich.: Dr. Abell has put forth another plea for preventive measures. There is no doubt left in the minds of progressive practitioners regarding the value and the far-reaching results of such measures. The big problem is the method of application. Dr. Abell has laid great stress on the education of mothers as the avenue which promises the greatest return. There is no question that this is the most expedient and effective method of accomplishing the desired results. I have tried to analyze the reasons why the dentists are luke-warm when the subject of prevention is advanced. The general attitude reminds me of what takes place in the promotion of some new religion. The older men give it serious consideration and appreciate its value, while the younger members seem to pass it by as something not profitable or essential to them. At the present time, there are two great changes occurring in the business and professional world. The business world is adopting professional ethics in their commercial dealings, with splendid results, as this action has proved of great value to big business as well as to the individual. The professional world is attempting to introduce business methods in their field, and up to date have failed to realize the benefits that should follow. Business to the professional man seems to mean finance only, but business methods require systemic plans for future development of our profession so that the greatest good will result to the greatest number in the shortest possible time. A problem such as that Dr. Abell has presented today demands consideration from a business angle, as well as professional knowledge. The illustrations shown have refreshed our minds on conditions that develop from simple causes preventable by proper education. I feel that each one present will be stimulated to serious thought regarding this important phase of orthodontia.

William Pilcher, Petersburg, Va.: If the temporary teeth of a child about 4 years of age fail to separate in normal growth, what means or what method can be used for training those teeth? Should one treat teeth oneself or refer them to a physician. Dr. Abell, what do you do about separating them?

Dr. Abell: May I answer at the close of discussion?

Vice-Chairman: Yes.

J. P. Corley, Sewanee, Tenn.: If it is true that nutrition and function are the two major factors in normal growth and development it would also follow that the most frequent and the outstanding cause of faulty maxil-

lary development is a lack of mandibular function. Since our American cuisine affords so little in the way of grindable material, would it not be logical to prescribe as a prophylactic measure in, I might say, our routine practice, the use of chewing gum? Twenty or twenty-five years ago, I read a paper before the Tennessee Dental Association on the prophylactic value of chewing gum. It "fell flat," of course, and I have heard nothing or little in the way of discussion of the practice of the habit. The enormous tonnage of chicle which was being imported into the United States at that time was astounding. To my mind, it represented a protest on the part of Nature against the cook. Of course, our first thought should be the education of the housewife so that the children may have what Nature meant that they should have in the way of an opportunity for developing their jaws, but since that is a more difficult problem, and perhaps would be much slower of introduction, would it be logical to prescribe the use of chewing gum? I would like to have Dr. Abell describe his treatment of the child whose case is shown in Figure 13.

A. B. Kelly, Yazoo City, Miss.: I want to say two or three things which I hope may lead Drs. Dunn and Abell to feel that they have scattered some seed among the general practitioners which may in due time, reap a harvest. A good many years ago, I, like many others who were then in college, studied a little orthodontia. I had the privilege of studying under the distinguished Dr. Gilford of the Philadelphia Dental College, yet I received little on the subject as we know it today. I say without any reservation that there are things that the general practitioner ought to do, and that he ought to know, in orthodontia, but certainly he should not step farther than his information and ability warrant. Dr. Abell calls attention very forcibly to the early treatment of children's mouths. There must be other general practitioners in this audience, and some probably from as small towns as that from which I come. Of course, we cannot specialize in small towns, but I contend that we must know a little about a great many things in practice, among these, orthodontia, but we should not undertake things about which we don't know, nor attempt to care for orthodontic cases when orthodontists are within reach. I am about midway geographically between Memphis and New Orleans and until recently there was not an orthodontist between these two places. Patients cannot, every time, go such distances for minor matters in this work. But it sometimes happens that something must be done. Then the general practitioner must be able to do that "something." On one occasion, a year or two ago, a patient whom I had sent to New Orleans and who had had appliances made, had to have an adjustment. The lingual arch was being used. I was out of town. The patient went to another dentist, and that dentist could not remove the appliance, and it was broken. Because I had had a little training, I had no difficulty in removing it, to the delight of both mother and child. Every practitioner, and certainly those of us who practice in the country towns, ought to know enough about orthodontia and the appliances used in the practice of it, to be able to remove an appliance if it gets broken, or to put it back in case it comes off. We who practice in towns from 50 to 100 miles from an orthodontist are going to have, at times, to do minor adjustments, and it is up to us to be able to do our part. Dr. Abell spoke of a chart, which he suggested possibly many of us have. On many occasions when I have run across such conditions as those to which he has directed our attention, I have called my patient's attention to it as is shown in this chart. That is one of the most helpful things of its sort to be had in an office, and I am glad that our attention has been called to it. It is very important to watch the mouths of these small children, and if anything goes wrong with them, we ought to be able to make a diagnosis and see that a correction should be made, and should advise our patient to go at once to an orthodontist. Dr. Abell spoke also of the needed cooperation of the patient with the dentist. That is agreed, and, further, we dentists should cooperate, from start to finish, from beginning to end, with the orthodontist. We need to cooperate with him first of all by trying to gain information from him, and if we have not any information at all, we should go away and take a four weeks course on the subject, so that we may know in the future where our responsibility lies. Orthodontia is an important subject, even for the general practitioner. An understanding of periodontia is no more important to the general practitioner than an understanding of orthodontia, and when he is able to do the things to which I have

directed attention, he will not, when his patient reaches the age of 18 or 19 years, be ashamed to look at his or her mouth, but to the contrary, will feel that he has done something for humanity.

W. S. Locke, Cincinnati, Ohio: It has always seemed to me that the dentist should refer every child to the orthodontist when it is possible so to do. The dentist does not know, and is not expected to know, of the malformations of that mouth, and consequently, I believe, we should teach the dentist, if possible, to refer these cases early. As a rule, he does not do it until he sees something wrong in the mouth.

Dr. Abell (closing): Regarding the method of expanding temporary teeth that was asked for: One can build a removable lingual 0.028 gold platinum arch running well on the gum tissue to allow for recurrent finger springs to move the teeth laterally and labially. Concerning the infraocclusal cases, such as that shown in Figure 13: If they present at a time not too near the time of shedding of the temporary molars, these molars can be built up with crowns or cast overlays to a point where the cuspids clear in trituration. This allows the first permanent molars to erupt to the proper height. If possible, these cases should be under the care of an orthodontist. I heard nothing about the ethics of calling in the mothers for instruction and advice. I expected adverse criticism on that. It is desirable that there be fuller cooperation of dentist and orthodontist. I think I am safe in saying that all orthodontists have taken a dental course and are familiar with the dentist's problems, but few of the dentists have felt it necessary to take more than a smattering of orthodontic subjects. All meetings of orthodontic societies are open to all who are in any way interested in orthodontics. Dental literature is full of orthodontic subjects that are seldom read by regular dentists. Fuller knowledge will promote fuller cooperation. I believe it is not only the privilege, but also the duty, of dentists treating children to become familiar enough with dental anomalies that they can recognize them and advise the mother as to correction.

Abram Hoffman, Buffalo, N. Y.: Dr. Abell wondered why the thought brought out regarding ethics was not discussed, and I smiled because I had made a memorandum "to call in the mother and every child under 10 years, for examination and consultation." What about the ethics of this? I think Dr. Abell answered it himself. If the heart and the mind are in the right place, we are all right because—what do we understand by ethics? You may say that it is the science or art or what not of doing right. If our heart and mind are right, that is all there is to ethics. The manner and mode in which we are living has changed wonderfully in the years gone by, and it is no more than right to expect that the code of ethics of dentistry should change in accordance with the changes that are taking place along with it. I believe, Dr. Abell, that the ethics of your procedure is perfectly proper. I wish that we had more men in orthodontia, and more men in general practice, in harmony with the ideas that have been expressed by Dr. Kelly. For many years I have been giving talks to the general practitioner and have not had one response equal to the one you have made this morning. You have spoken in a manner that every orthodontist will deeply appreciate. If we had more men with your attitude in the practice of dentistry, many of the problems of practice in orthodontia that are encountered every day would be simplified.

PORCELAIN RESTORATION OF VITAL AND PULPLESS TEETH*

By JOHN J. MOFFITT, D.D.S., Harrisburg, Pennsylvania

THE profession to which we have devoted the chief activity of a lifetime exacts of us a contribution toward furthering the appearance, comfort, health, efficiency and a span of life of those who trust to our care the delicately devised and complexly constructed mechanism known as the teeth.

A flawless set of teeth in a healthy mouth is a possession that has scarcely an equivalent in all the manifestations of Nature, and is an indispensable factor in achieving our earthly goal—health and happiness. An imperfect set of teeth, in the surroundings that accompany its worst stages, is one of the most abhorrent things to be encountered and is a permanent menace to the possessor and his descendants.

These phenomena of evolution, developed through the ages to our present requirements, are by no means unnecessary to our existence, and must therefore be given the attention that their importance demands. One means of promoting the usefulness, appearance and durability of this dental equipment, when it has been disabled by our inappreciation, is the employment of porcelain in making fillings, crowns and bridges for its restoration.

It has been the custom in dentistry, as in other occupations requiring more or less mental exertion, for the enthusiastic members of the profession to rush to extremes when attention has been generally directed to some advantageous procedure, and thus exceed the limits of its benefactions and injure the reputation of the profession. This has been so in the case of gold shell crowns, methods of root treatments, the use of amalgam and the practice of exodontia.

One of the most recently developed and widely used porcelain restorations is the jacket crown, and there is at present some slight danger of its getting into the class mentioned above. Porcelain jacket crowns have been made by Dr. Capon and other conservative porcelain workers for more than thirty years, but only recently have they become accessible to the general practitioner.[1] In many cases, it is not necessary to cut away the entire enamel surface of a tooth in order to make a presentable restoration and save the pulp. We all know how to make porcelain jacket crowns and if we are unable to do so the laboratories can make them for us; but a partial jacket crown is often quite as effective and no

*Read before the Section on Operative Dentistry, Materia Medica and Therapeutics at the Sixty-Seventh Annual Session of the American Dental Association, Louisville, Ky., Sept. 24, 1925.

1. Disc., Dent. Brief, April, 1915.

more difficult to make, and it preserves more of the original design of the tooth and its gingival relations. When it is necessary to restore the labial and approximal surfaces of an anterior tooth, there is no particular reason for cutting away the lingual surface, and an impression from a tooth thus prepared is quite as easily made into a presentable restoration with the porcelain veneer or any other method employed in making an entire jacket crown. (Figs. 1 and 2.)

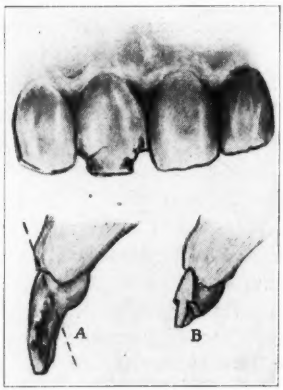

Fig. 1.—Method of preparing tooth for a partial jacket crown: *A*, limit of cutting to preserve lingual and approximal areas; *B*, vital tooth prepared for partial crown.

A jacket crown for a vital molar tooth can be made by the indirect method that we employ for making porcelain inlays thus: A wax pattern is made of the required restoration as regards its adaptation to the prepared root and its occlusal relations and contour. (Fig. 3.) No more of the patient's time will be required than it takes to make this wax pattern and, afterwards, to cement in place the completed crown.

A casting of this pattern is made in gold or aluminum or any other casting metal. From the base of this crown, a casting is made that will represent the prepared root, to be used as a counter die with the first casting in shaping the platinum foil. When this platinum matrix is prepared, it is placed on the casting of the crown and then set up on a furnace slab. When this is sufficiently set, it is placed in the articulator, and the impression of the crown is taken in plaster. The crown is then removed, the platinum being left on the slab, and on this the porcelain crown is built up. By making a tray for the slab on any small articulator, or making the whole thing from a brass hinge, the operator is enabled to return his work to the articulator when a measurement is needed. (Fig. 3F.)

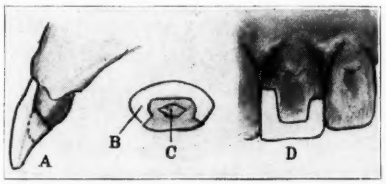

Fig. 2.—*A*, partial jacket crown, showing use of porcelain veneer; *B*, sectional view of partial jacket crown; *C*, pulp; *D*, lingual view of partial crown.

Porcelain Inlays, Direct and Indirect Method.—The satisfaction that porcelain inlays give to the most discriminating of our patients and the superior value of the inlaid filling in the preservation of the life of a tooth should secure for porcelain work a foremost place in dental operations; but there are, at present, certain obstacles that have prevented its general adoption and

have caused it to retain the nature of a specialty. One of these is the idea in the mind of the public that the longer a filling stays in place, the better filling it is; yet one of the chief causes of alveolar abscess arises from permitting fillings to remain too long in place, concealing infections that finally reach the pulp. To preserve the teeth of a patient through his lifetime, it is necessary to remove the fillings and resterilize the dentin every two or three years, if there is the least suspicion of decay. The inlaid filling is best suited to this method of tooth preservation, but it is obvious that the operator must give considerable attention to securing conditions favorable for retention. This has already been discussed at greater length than is possible in this paper.[2]

It is advisable for the porcelain worker to be familiar with both the direct and the indirect methods of making porcelain inlays and to be proficient in each. For some patients, it is almost impossible to use the direct method even in cavities easy of access, but as the direct method is the quickest, it is sometimes necessary to employ it. One direct method for small cavities is to bake a button in the bottom of a platinum matrix that was burnished to the bottom of the cavity only; then, using this button to hold the platinum in place, define the margins by burnishing

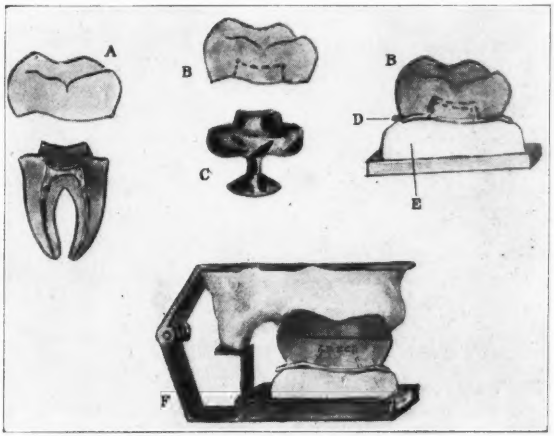

Fig. 3.—*A*, wax pattern for molar jacket crown; *B*, casting from wax pattern; *C*, counter-die cast from casting shown at *B*; *D*, platinum matrix; *E*, investment compound on furnace slab; *F*, investment on articulator for measurements for baking; with porcelain veneer, and porcelain baked between it and platinum matrix.

2. Moffitt, J. J.: Dent. Cosmos, 56: 681 (June) 1914.

them in the cavity, adding the remainder of the porcelain in the next baking. (Fig. 4A and B.) In the preliminary baking of larger fillings, distortion of the matrix by shrinkage may be prevented by filling the matrix to the required depth with the moist porcelain powder, touching it with a piece of blotting paper cut to a point until just the required plasticity is obtained, then, with a smooth steel nerve bristle, cutting it into divisions suggested by its shape. These cuts should be made clear through to the platinum matrix so that there can be no joining of the segments in the first baking, or the result will be unsuccessful. (Fig. 4D.)

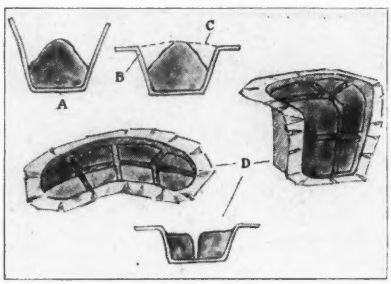

Fig. 4.—*A*, first baking; *B*, platinum foil burnished to cavity; *C*, contour of finished filling; *D*, method of dividing porcelain to avoid shrinkage.

For filling approximal cavities by the direct method, the platinum foil should be shaped similarly to the cavity before inserting, with a pair of applicators or pliers, and the edges flattened so that they will go between the teeth. In this way, a definite margin is obtained all the way around the cavity, and there is not so much danger of puncturing the platinum foil as when it is inserted between the teeth before the shaping is begun. A moistened cotton pellet larger than the cavity is forced into this platinum cup to spread it through the cavity, after which the bottom and the edges are burnished. (Fig. 5.)

In adapting platinum foil to a cavity, it does not matter how many folds of platinum occur in the matrix provided they are burnished down flat, so that the matrix can easily be removed from the porcelain after the baking is completed. Burnishing of the platinum should be done with two small dull instruments, the operator holding the platinum on one side of the cavity with one instrument while burnishing the platinum to the opposite side with the other. These instruments should not be tempered, so that they can be readily bent to any desired angle and are not harsh in manipulation. Wax should be used to retain the shape of the matrix and to represent the contour of the filling when investing. When the technic of burnishing is acquired for all positions, it is often more satisfactory than the indirect method, except

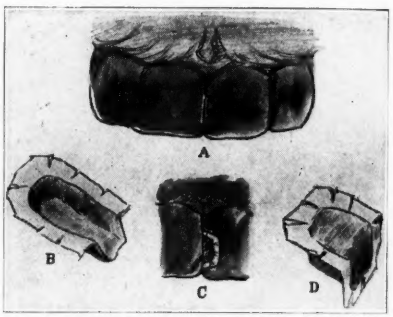

Fig. 5.—*A*, lingual cavity; *B*, platinum foil shaped like cavity before inserting with flat edges to go between the teeth; *C*, platinum foil pressed in with cotton and burnished; *D*, completed filling.

when the personality of a patient or an impossible location interferes.

The indirect method for making porcelain inlays has its distinct advantages. It requires less of the patient's time and less of the operator's time to prepare the matrix, and the filling can be completed in the laboratory, enabling the operator to proceed with other work while the filling is being made. One method is to cast the original impression of the cavity and, from this, make a counter-die by the casting method, from which the matrix and the contouring of the filling are completed in the usual manner of making a porcelain inlay. Another method is that described by Dr. Avary.[3]

Restoring Corners and Lost Contours in Vital and Devitalized Teeth.—Corners and lost contours in vital and devitalized teeth can be restored very efficaciously by the use of porcelain instead of platinum posts. The porcelain post becomes a part of the porcelain filling, while the metallic post to some extent weakens it by its presence in the porcelain. In thin corners of vital teeth, this is an important factor. When the corner of a vital tooth is broken off and there is a no cavity, the use of a porcelain post makes its restoration a simple matter. Instead of cutting into the tooth for a retention cavity, the edges are straightened up, and with a new fissure bur of the right diameter, a retention hole is made in the dentin, just large enough to receive the porcelain post. (Fig. 6.) The porcelain post is prepared, with reference to the diameter of the bur used, by breaking a piece from a thin facing and grinding it with a carborundum wheel to the required shape. This is just long enough to extend to the area

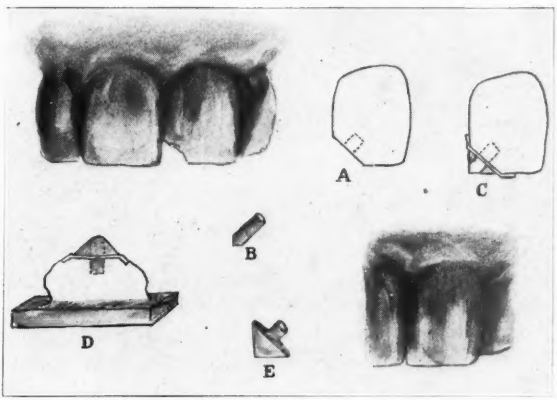

Fig. 6.—*A*, diagram showing preparation of tooth; *B*, porcelain post; *C*, porcelain post, platinum foil and wax in place; *D*, porcelain corner in investment; *E*, finished porcelain corner.

3. Avary, Hugh: High Lights on Porcelain in Dentistry, J.A.D.A., 12: 807 (July) 1925.

where the corner of the tooth is to be, and is shaped with the view to defining the contour of the tooth. (Fig. 6D.)

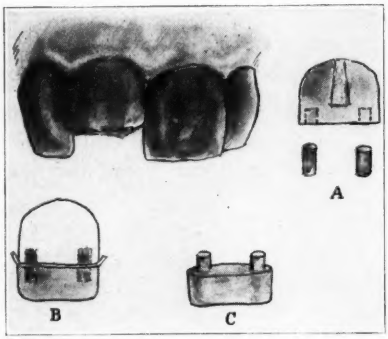

Fig. 7.—Incisal restoration of vital central incisor: *A*, porcelain posts; *B*, posts, platinum foil and wax in place; *C*, finished restoration.

A piece of platinum foil is then burnished over the prepared corner of the tooth, and, through this, the porcelain post is inserted into the retention hole. Wax is added in the shape the porcelain is to be when baked, so that it will hold the post and platinum foil in their relative positions when removed. This is invested on a furnace slab, and the wax is replaced with porcelain and baked in the furnace. The porcelain post, being higher fusing than the rest of the porcelain, will hold it up to the desired contour during the final baking.

When an entire occlusal edge of an incisor is gone, two posts may be used, one on either side of the pulp. (Fig. 7.) Porcelain posts can be used advantageously in all approximal contour restorations, (Fig. 8). In devitalized anterior teeth needing entire incisal contour restorations, larger posts can be used so that only one is necessary for obtaining retention. (Fig. 9.) These posts should not be any longer than their width in order that they can be easily removed if broken off. Three porcelain posts can be used in crowning a

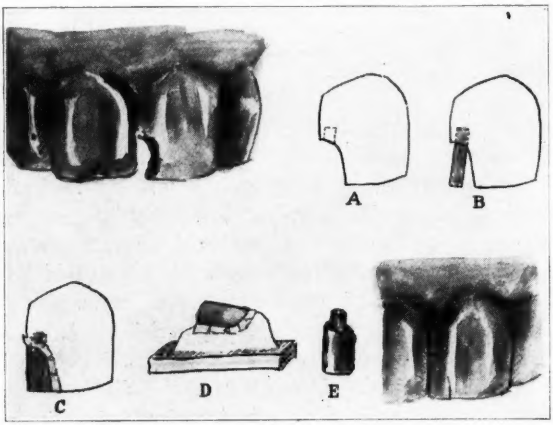

Fig. 8.—*A*, diagram showing preparation of approximal cavity; *B*, porcelain post prepared for anchorage; *C*, porcelain post, platinum foil matrix and wax in place; *D*, investment of material shown at *C*; *E*, completed filling.

devitalized molar, if the pulp chamber is lost, by enlarging the root canals. (Fig. 9.)

Cervical Fillings.—Porcelain fillings in the cervical region of teeth are exceptionally difficult on account of the sensitiveness in that locality and because of the difficulty of making them inconspicuous. They are of great benefit to patients in reducing the sensitiveness of eroded teeth and in protecting the pulp,

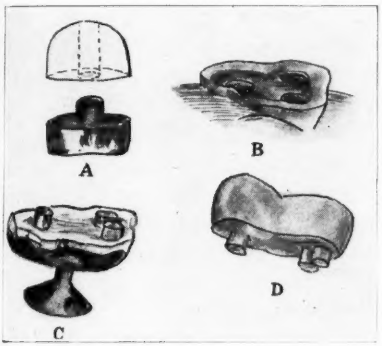

Fig. 9.—*A*, method of restoring incisal edge of devitalized tooth with porcelain post; *B*, preparation of devitalized molar tooth; *C*, matrix and porcelain posts on casting made from that shown at *B*; *D*, finished restoration of devitalized tooth.

because of their insolubility and the fact that they do not transmit heat or cold.

There are three ways of preparing sensitive cavities: (1) by nitrous oxid or other anesthesia; (2) by induction or infiltration, and (3) by direct pressure with cocain. The latter is accomplished by wiping the cavity with chloroform and then putting in it a few cocain crystals dissolved in a drop of water. A ring of chloroform and guttapercha is made around the cavity before the cocain (in a very small quantity) is inserted. A piece of guttapercha of suitable size is then forced in suddenly with all the pressure possible so that it will adhere to the edges and bring pressure to bear on the cocain within the cavity. It is necessary to use the chloroform first in the cavity to make the ends of the sensitive fibrils receptive to the cocain. In some cases, this works very effectively.

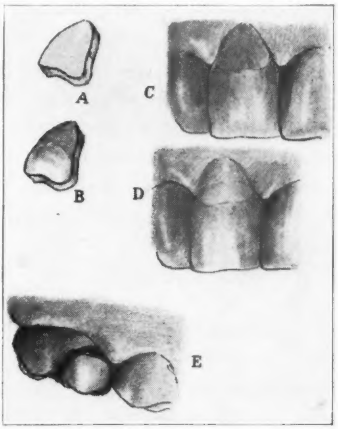

Fig. 10.—*A*, cervical filling without shading; *B*, cervical filling with shading and pink porcelain; *C*, unshaded filling in place; *D*, esthetic restoration of the same case.

It is not always necessary to make all the edges of a cervical filling square, but where the filling is to be inconspicuous, it is advisable, as a margin perpendicular to the surface of the tooth will be least affected by the shadow of the cement. (Fig. 10.) On account of their position, these fillings are usually quite thin and, in most cases, have to be baked several shades lighter than the color of the teeth where they join the dentin, so that, when

darkened by the cement, they will match as nearly as possible. The thinner and more transparent the porcelain, the lighter in shade it must be made. These fillings should always be darkened at the cervical margin to match the shading of the other teeth. When the filling extends some distance beyond the gum margin, a pleasing result is often obtained by making the gingival restoration of pink porcelain so that the crown of the tooth will not appear too long. (Fig. 10.)

Porcelain inserts can easily be made in large contoured gold inlays, especially in the mesiobuccal cusps of upper first molars, by drawing out the wax where the insertion is to be made. Then after the gold is cast, the platinum foil is burnished in the place in the gold inlay prepared for the porcelain. In this way, a good deal of the effect of the too prominent gold is reduced. (Fig. 10.)

Retention.—One of the objections to fillings made as inlays is that they are not so stable as fillings requiring undercuts for retention. This is particularly true of porcelain inlays in which it is more difficult to get retention by the shape of the filling than with metal castings. Retention of porcelain inlays depends on four things: (1) the shape of the filling at the base; (2) the shape of its articulating surface with reference to the forces to be exerted on it; (3) the condition of the dentin, and (4) the handling of the cement. As mentioned before, we cannot go into these in detail. It is not a good plan to etch the porcelain with acids or to roughen it with a wheel to promote adhesion. If a rough surface is desired, it is better to obtain it by having the first baking of a higher fusing porcelain and not completely glaze it so that it will present a biscuited surface to the cement. An important consideration in the retention of properly shaped porcelain fillings is the method of handling the cement. If it is possible, an assistant should mix the cement while the operator is drying the cavity. It is imperative to have a knowledge as to how stiff to make the cement in order to get the best adhesion; to have it set in a reasonable length of time, and, at the same time, to permit all excess cement to be squeezed out from beneath the filling. This cannot be done carelessly if a fair trial is to be given porcelain work. Just before inserting the cement, the cavity and the filling should be wiped with chloroform. This should be used carefully in the mouth on account of its liability to spread along the tissues. The assistant should prepare half-a-dozen cotton pellets, one-eighth inch in diameter for applying the chloroform. Chloroform dissolves oils that may remain from antiseptics, guttapercha that may remain from temporary fillings and the vital ends of the live tubule contents; which alcohol will not do, and the former is more acceptable to patients than ether, which is also an effective solvent of lipoids. When the cement is expertly mixed, the assistant places it on the inner surface of the filling, while the operator spreads it over the entire cavity surface. This is to insure thorough adhesion; to keep control of the patient and lessen the liability of having moisture come in contact with it; to prevent air bubbles which raise the inlay after insertion, and to enable the operator to get the

inlay into place before crystallization begins in the cement. A rubber dam should not be used, as it is seldom needed where it will not injure the gums. If an operator has no assistance and his patient will not voluntarily remain still, a rubber dam will probably be necessary. The use of cotton rolls held in place by sticky wax on the upper teeth, and clamps or compressors on the lower teeth is sufficient in most cases. Where cavities extend beneath the

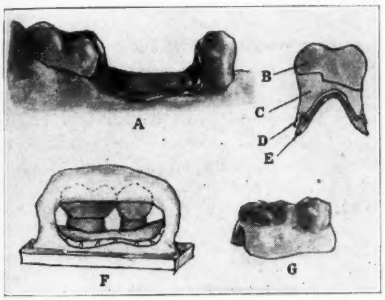

Fig. 11.—*A*, metal preparation of removable bridge; *B*, porcelain tooth; *C*, wax; *D*, platinum foil; *E*, gold saddle; *F*, first baking between platinum impression and porcelain teeth; *G*, finished block.

gingivae, packing with guttapercha for several days, should be resorted to, until the cavity margin is visible. Then epinephrin chlorid solution applied on a pellet of cotton for ten minutes will dry up the tissues. The patient must remain in such position that the filling will not become moistened until the cement is thoroughly hard, which is determined by a sample of the same mix kept on a tray so that there will be no chance of a mistake in this regard. It is better not to use submarine cements in inlay work, in fine dental operations.

Porcelain Blocks for Light and Hygienic Bridgework.—Porcelain blocks are very desirable in bridgework, especially of the removable variety. They are clean, light and good looking. They can be made to fit a gold saddle with rims, and can be cemented after the metal work is completed; or the entire saddle and teeth can be made of porcelain. The first method is as follows: After the saddle, rims and attachments of the denture are completed, an impression is made of the parts that are to be supplied with the porcelain block, in platinum foil. (Fig. 11.) Suitable teeth, either diatoric or plain rubber, are selected. In the latter case, the pins, unless they are platinum, are ground out, and the teeth are waxed to the platinum foil on the denture. When this is properly adjusted as to occlusion, it is removed and invested on a furnace slab. It is then set up on an articulator in such a way that it can be easily taken from the furnace and replaced on the articulator when a measurement is required. (Fig. 11.) In this manner, a block may be completed, using pink porcelain for the gums, and other pigments suggested by the adjoining teeth. When completed, this is cemented to the denture. These blocks can easily be removed by boiling about ten minutes in nitric acid when necessary repairs must be made to the metal, after which the block is recemented in place.

Attention and study should be given by the porcelain worker to the following important subjects that cannot be covered here: cavity preparation and the sterilizing of cavities; exclusion of moisture and manipulation of cement; selection of cements; firing and cooling

of porcelain; the use of porcelain of different fusing points, and, last, the procuring of advantageous occlusion of all the teeth for the protection of porcelain work.

CONCLUSION

Porcelain work, which is sought after by the most exacting patients, demands the entire application of the operator. It cannot be done successfully in a haphazard manner. When a patient desires to have his teeth "fixed" at the least possible expense, the operator is aware that it is not a case for porcelain and must employ material suitable to his request. When he desires to be made comfortable in the least possible time, similar measures must be taken. When he requires something that will last and give him the least trouble, another kind of material is indicated. But when he requests porcelain work, it usually means that he desires the correct shade, the natural contour and reasonable durability, with the preservation of his teeth as an ultimate aim. To the dentist seeking only his own profit, porcelain work makes but little appeal, but to many others, it is a study of fascinating interest and it furnishes numerous occasions of satisfaction in achievement.

200 Pine St.

DISCUSSION

Edgar H. Keys, St. Louis, Mo.: The practice of general dentistry is beset with a maze of divergent paths through which we are of necessity compelled to trace and dizzily retrace our steps day in and day out. To progress consistently along all of these diversified routes is quite impossible. Fortunate indeed is the specialist who has been able to free himself from impediments and devote his energies to that daily task which appeals to him most. For the general practitioner, the next best thing is to have one favorite pursuit among the many duties imposed by a general practice. With many of us it is the gold inlay, with others, bridgework; with still others, prophylaxis or prevention, and so on. It is the hobby that helps carry us over the more arduous requirements of a general practice. When you have found something that you enjoy playing with during spare moments of daily routine, you have found the antibody of monotomy. If my memory serves me, the jacket crown was originally conceived as a means of correcting that anomaly called the peg-shaped tooth. One might well believe that, in the minds of many, this is still the restricted field for this type of work in dentistry. Obviously, for economic reasons, it must not be expected that all men, regardless of their clientele, should execute this type of restorative work. There is no reason why any of us should be unversed or unable to execute the technic up to the point of submitting well-made preparations to a porcelain laboratory, when the need of such service is met. I mean by that, if you are not baking porcelain in your own office, occasions will arise when a patient is in need of some particular type of porcelain work. You can get this service at some good laboratory, but you should not be misled by the activities of some so-called porcelain expert who sends out literature telling the correct and the incorrect way to make a preparation. I know of one particular instance in which the instructions given were exactly the opposite of the accepted technic. The large, golden mesio-incisodistal silicate camouflaged restoration is usually unsightly and frequently unsatisfactory. Those restorations are frequently seen complicated by a Class five cavity (Black classification) plus a gingival involvement. The jacket crown placed upon such teeth yields by far the most gratifying result. Deep discoloration of the enamel on any of the eight anterior teeth, due to a past pulp disturbance, is another reason for the employment of this ideal restoration. Correction of an anomaly frequently can be accomplished. It is not at all an infrequent occurrence to see a mouth in which a lateral incisor has not erupted and the cuspid may have migrated to the position the lateral should have occupied. In quite a few instances of this kind, I have reduced

this perfectly normal cuspid crown and veneered it with a jacket of lateral form, although the cervix is not ideal because the diameter and circumference are not of lateral proportions. The bicuspid is so nearly similar to the cuspid at the labial surface that it does not appear unnatural in the cuspid position. Dr. Moffitt makes the statement that we all know how to make jacket crowns. It is interesting to note how many patients have never heard of a jacket crown. Dr. Moffitt speaks of making a molar jacket crown, taking the occlusal (I suppose a third) of the diatoric tooth, grinding this in and then building the rest of the crown in proportion. I have forgotten whether he referred in his paper to the use of the facing as a veneer in making up the labial surface. I do not favor the sectional method of using a facing for anteriors or an occlusal portion taken from a diatoric tooth. I do not believe this type of crown has the strength of the one built and carved in its entirety. This technic offers less difficulty than finding and grinding a suitable occlusal section to place. The porcelain post is good, and some one sitting beside me in the audience told me that these small porcelain posts can be purchased. In reference to the post shown on the screen, going diagonally from the incisal angle toward the distogingival aspect, I don't quite understand how Dr. Moffitt gets that inlay in place, if the tooth adjacent is in close contact, unless he gets a tremendous amount of separation. I find the descriptive technic interesting and instructive. I should like to make one suggestion that will be found helpful during cementation. Jacket crown work is not infrequently carried out successfully up to this point, only to be met with disaster during an attempted cementation. The Cleveland Dental Manufacturing Company will take old Perry separators or make new special length screws which will enable one to grasp with the separator the tooth adjacent on the mesial and the one adjacent on the distal side to the tooth to be crowned. This solves the difficulty in contour and contact.

W. P. Smedley, Denver, Colo.: The partial jacket crown has been used, more or less, probably about as long as the full jacket, but the cases in which it would be preferable are rare. The method of making a molar jacket, starting with a wax pattern, does not appeal to me as practical for general use, as it is too difficult, working directly, to make in wax a perfect impression of the gingival shoulder, and there are enough chances to go wrong with the regular method without adding additional steps. It is indeed important to be proficient with both methods of procedure in inlay work, but it had never occurred to me to base the selection of a method on the personality of the patient. The determining question should be: How can the platinum be most accurately adapted and with an ample extension, one or more millimeters, beyond the cavity margin in all directions? This broad wing of platinum, extending at an approximately right angle to the side walls of the cavity, effectually resists the pull of the shrinking porcelain, obviating the necessity for investing and at the same time making it easy to visualize the portion of the tooth to be restored. For cervical cavities, the indirect method should be used, as it is quite impossible to fit a matrix with sufficient overlap on account of the elasticity of the gum. Impressions for these cavities can be quickly and accurately made if cone-shaped pieces of compound in assorted sizes, and having flattened extensions for a thumb and finger grasp, have been previously prepared. By selecting one approximating the cavity in diameter, a few millimeters back from the apex, heating the point and using the balance as a plunger, the softened compound can be readily forced under the free margin of the gum, into the bottom of the cavity and over several millimeters of the face of the tooth, making an accurate impression of the cavity and enough of the face of the tooth to establish the correct contour for the inlay. Incisal angles and most approximal cavities are best handled by the direct method, as there is nothing to be gained by using the more tedious indirect method, and there is a distinct disadvantage in not having the labial and lingual surfaces and the incisal edge of the tooth reproduced in the platinum matrix. There is one other thing beside the liberal use of platinum that makes for the success of the uninvested inlay or jacket and that is thorough and frequent annealing of the platinum during the swag-

ging and burnishing process. I have known a number of men to contend that platinum could not or should not be annealed by the dentist, probably being misled by the dealer's statement that the foil was thoroughly annealed and ready for use. Doubtless, a good deal of distortion that is attributed to the shrinkage of porcelain should be blamed on the springiness of the unannealed platinum. Not only should the matrix be annealed several times during the shaping, but also, when it is accurately fitted, it should be once more annealed and returned to the cavity for careful scrutiny, to make sure that the platinum does not spring away from the margin of the cavity at any place. If it should, it can be readily settled to place with the ball of a finger, in working on a model, or, if in the mouth, by being held in place with a strip of rubber dam and pressed firmly with a pledget of cotton or piece of unvulcanized rubber. A small orthodontia blowpipe standing close at hand makes annealing very simple. I do not grasp the idea of reproducing the ultimate form of the inlay in wax, especially in proximal cavities, where it could only serve to interfere with the removal of the matrix from between the teeth. Nor can I agree that "it does not matter how many folds of platinum occur in the matrix provided they are burnished down flat so that the matrix can easily be removed after the baking is completed." We should aim to so shape the cavities that the one one-thousandth inch space left by the removal of the platinum is largely eliminated by settling the inlay into the cavity when cementing. Folds causing an extra two one-thousandths gap are to be regretted, not to mention more numerous folds. It has not been my custom to use the porcelain post anchorage instead of platinum pins for incisal corners and tips, and I am sorry to have to admit it, for Dr. Moffitt's method looks attractive to me, and I intend to use it the next time I find a case in which I do not consider the jacket crown preferable. It would appear that Dr. Moffitt's porcelain inserts in gold inlays are to be made to fit the gold casting, in the absence of the patient. If that is so, I would suggest that it is better to finish the preparation of the cavity for the porcelain after the gold has been set, letting the tooth form one wall of the cavity, and thus avoiding a line of gold. Dr. Moffitt is still worrying about what shade his inlays will be with oxyphosphate cement under them, especially the cervical. That has not bothered me for the last six or seven years, for, during that time, I have used silicate cement almost exclusively, matching the color and translucency quite satisfactorily. It can be handled successfully when mixed very little thinner than the directions advise for a filling. Of course, the silicate is not so effective a cementing agent as oxyphosphate, but that disadvantage is largely offset, in all but the cervical cavities, by the fact that much of the thin, almost transparent, labial plate of the upper anterior teeth can be saved, thus materially improving the retentive form of the cavity, as it directly opposes the displacing force of mastication. The cervical cavities do require a little deeper cutting; and this affords an opportunity to mention a method of cocain pressure anesthesia for these cavities, somewhat different from Dr. Moffitt's but very satisfactory. A tiny cone of base plate guttapercha is placed on the end of a slightly tapered cylindrical instrument about the diameter of a No. 2 bur. Protecting the tooth from moisture, the operator drills quickly with a sharp No. 2 bur through the carious dentin and into sound dentin. This tiny shaft is filled with a strong cocain solution, the tip of the guttapercha cone is heated, and with the harder part of the guttapercha and the instrument as a plunger, it is forced with considerable pressure into the pit. This method is applicable wherever access can be had to live normal dentin, provided pressure can be exerted in direct line with the long axes of the dentinal tubuli. Prosthetic dentistry affords a broad additional field for baked porcelain, and the examples portrayed in the paper are very excellent ones. It is a bit disconcerting after etching porcelain with hydrofluoric acid for so many years to learn that it is "not a good plan," but as I am not a believer in the frequent removal of inlays, I think I shall continue the practice. There is no adequate means of sterilizing carious dentin and there is no recurrence of decay under a properly placed filling or inlay if all the affected dentin has been removed. Subsequent caries adjoining a filling is a very different matter. The carious dentin should be thoroughly removed regardless of its

proximity to the pulp. If the pulp is uncovered, it can be completely protected by covering it with a sedative cement. If it is not exposed, it should still be thus protected from the cement or other filling material to be subsequently used. Of what value is a beautiful porcelain inlay or jacket crown if there is not a vital healthy pulp inside the supporting tooth?

Dr. Moffitt (closing): If the gingival relations and lingual aspect of a tooth can be saved, it ought not to be ground down just to make a jacket crown. I am glad to hear that porcelain posts are being manufactured.[4] About getting room for approximal fillings with porcelain posts: we do not need so much room as for a condensed gold filling. Prepare the cavity, put in a little gutta-percha and in a few days you have enough room. The retention is straight up and down, not crosswise, to avoid cutting off vital tubules. Make square bottoms to posts for best retention, and no more space is needed than enough to get the platinum foil between the teeth. Dr. Smedley prefers the indirect method for cervical inlays. Either way is all right, but I think in small cavities the direct method I described is a very easy one. Jacket molar crowns also can be made indirectly as well as directly. It isn't necessary to anneal platinum with a blowpipe. Every time we bake the porcelain, the platinum is annealed better than with the blowpipe. About making folds of the platinum in the bottom of the cavity: it does not matter. If all fillings fit within two one-thousandths inch, we should be doing very well. Bacteria are so small that we can't exclude them from a cavity by any mechanical means. Hydrofluoric acid is not necessary for retention. Sterilizing dentin is very important. Do not cut out all decayed dentin if near the pulp. Cut the cavity down until the proper shape is obtained in regard to retention and margins, then make the inlay. After that, cut out what is possible of decayed dentin, but do not endanger pulp. Sterilize the dentin, using, first, chloroform, which makes it receptive to creosote applied under pressure. Thus, we have a much more conservative effect than if we cut out everything we can see regardless of the position of the pulp. Usually, we can find signs of decay under any filling after two or three years. The filling then should be removed and replaced, if we are trying to save the patient's teeth. If we are trying to save our dentistry, we should put in fillings that are destructively anchored, crowns with long pins, etc., and keep them in place a long time. It is keeping teeth at the expense of our dentistry that we must achieve rather than making our dentistry seem efficient at the expense of the teeth.

4. It was afterwards explained that these posts were for a different purpose—something to do with English tube teeth.

A STUDY OF FACIAL FORM AND COMPLEXION COLORS*

By E. H. BRUENING, D.D.S., F.A.C.D., Omaha, Nebraska, and
E. B. OWEN, D.D.S., St. Louis, Missouri

ESTHETICS or function—which is more important in the construction of full denture cases? Many of our patients prove to us in various ways that esthetics, or facial harmony, means most to them. It is true that man can develop a keratin or horny coating on the oral ridges, and more or less successfully perform the masticating function, but few people will appear in public without teeth, because of their unpleasant appearance.

One meets so many homely, misshapen human beings every day; and perhaps that is the reason the man or woman who has a "good looking" face or figure attracts so much attention. What are the lines of face and form that cause this marked differentiation between the beautiful and the ugly, or the pleasing type of person and the disagreeable one? A careful study of these lines will give us a keener pleasure in our work, whether it be the preservation of the present structure, or the reconstruction of the face by means of artificial appliances.

The personal appearance is a vital factor in his psychology, and may mean his success or failure in the important steps in life. Everyone has at least a subconscious desire to be just as "good looking" as possible, and this is as it should be. We all try to ward off the signs of approaching age. What is more important than the form, colors and lines of the face? Men will use many kinds of tonics and treatments to retain the few hairs that still adorn their heads. Women will spend fabulous sums on cosmetics, endure pain, and expend much time and energy to retain their "school girl" complexion, and slender figure. Neither sex is inclined to give the oral cavity enough serious consideration from the standpoint of good appearance. Perhaps the dental profession is not so careful as it should be in forseeing the serious changes in expression and face form that originate around the mouth, due to changes that take place within this cavity, such as abrasion, loss of teeth; pathologic destruction of tissues, such as caries and pyorrhea alveolaris; abnormal tooth movement, and faulty artificial appliances.

To appreciate facial harmony fully, we must also take into consideration the complete human machine, but in this short study we will mention only a few

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proportionate dimensions and comparisons of the head.

The width of the head across the eyes is five eyes length.

The space between the eyes is one eye.

The following distances should be equal: eye brow to chin, ear to ear, ear to nose.

The line of the nose and that of the ear are parallel.

The distance from the chin to the nose is the same as from the nose to the glabella, or space between the eyebrows.

The distance from nose to mouth should be one-half from mouth to chin.

These dimensions are approximate, as variation is Nature's law; but we can use them to aid us in corrective cases.

The mouth varies much in size and in the form of its boundaries. The lips should be full and rounded, the red parts, or vermilion borders, being clearly defined from the rest by a prominent margin. The upper lip should project somewhat over the lower so as to throw part of the lower lip in shadow. The normal form of the upper lip is a feature of great facial beauty. From the angles of the mouth, the red part of the upper lip should form an arch, the center of which is interrupted by a groove which passes across its center, from the septum of the nose. As this groove joins the red edge of the lip, it breaks the continuity of the curve and imparts to it that characteristic appearance called "Cupid's bow." This is the most prominent part of the lip. The upper lip varies considerably in length in different individuals, a short lip being regarded as one of the attributes of ideal beauty (especially when exposing good teeth). The lower lip, though full, should not project so far forward as the upper. Beneath its red part, there should be a broad depression separating it from the prominence of the chin, and thus tending to cause a shadow, which helps to accentuate its curved outline. At the angles of the mouth, the red parts of the lips are narrowed down to a line and tend to be inturned. The fullness of the tissues of the cheek here forms an angular depression which, thrown in shadow, breaks the otherwise abrupt union of the upper and lower edges. The modeling of these parts displays great subtility of form and imparts a delicacy and finish to the curves of the lips.

Expression is in great part due to the modifications which take place in the form and outline of the tissues in the area between the chin and the nose.

In the study of expression, the broader effects are easily obtained by what one may term conventional methods. It is only when the more delicate shades of difference are treated that we recognize the master hand. This may be illustrated by our experience at the theater. We acknowledge success and condemn failure almost intuitively. When the efforts of an actor fall short of our standard of experience, we do not hesitate to criticize his performance adversely, yet often we are unable to explain the reasons for his lack of success. He has failed to appeal to us because he has not seemed natural; for, though he has employed all the conventionalities of the art, he has omitted the niceties that infuse truth and realism into his conception.

The mouth ranks first as a modifying agent in the appearance of the features. The slight upturning of the

angles of the mouth gives the case an altogether different appearance from that noted when the angles are depressed. In support of the view that the mouth is such an important factor in the determination of expression, we have only to take into consideration the number of muscles that are influenced by its form. The orbicularis oris, the one of greatest importance to us, consists of an oval sheet of considerable thickness, which surrounds the orifice of the mouth. Its inner edge corresponds to the red margins of the lips; its outer border spreads upward toward the base of the nose, outward toward the cheek, and downward as low as the furrows that separates the lower lip from the chin. The muscle is connected by slender slips with both upper and lower jaws, above and beneath the front teeth. The bulk of the muscle, is made up of fibers, which pass across from side to side and turn upward and downward at the angles of the mouth. The outer border of the muscle is blended with the various elevators and depressors of the lips and the angles, and is also intimately connected with the muscles of the cheeks. The muscle closes the mouth by bringing the lips together. It also narrows the mouth and causes the lips to protrude.

So delicate and precise are the forms given to the lips in speech, the deaf can read by sight the words that fall from the lips of a speaker whom they cannot hear.

It is well to note how furrows, which play an important part in expression, develop. The most important of these is the nasolabial, which separates the rounded portion of the cheek from the wing of the nose, and, sweeping downward and outward, fades away perceptibly toward the angle of the mouth. With certain movements of the mouth, this furrow is emphasized and altered in its direction. In laughing and crying, it is much deepened and curved. It is deepened above when the skin on the side of the nose is drawn up and wrinkled, and it is straightened when the angles of the mouth are depressed. The furrow may either be carried around the angle of the mouth, or may be replaced by another that continues the curve of the upper lip downward and outward.

When an expression becomes habitual, the cast of the features is molded thereby. The face of a sleeping child is calm and expressionless. It is as if it were the clay on which Nature is going to stamp the characteristic features of the man. Expression uncontrolled is but the evidence of the working of the mind. According to the disposition of the individual, so the features become set. We recognize a morose and ill-tempered man by his look, for the habitual mood has indelibly changed his features.

Lines indicating unfavorable characteristics may be produced by the loss of teeth. Great care must be exercised in the molding of the face by means of artificial dentures to avoid influencing lines that may belie our patient's nature and perhaps seriously affect his life in an unpleasant way.

By observation of the faces that pass before us every day and a study of the excellent pictures that are available in our newspapers and magazines, it is easy to gain a valuable knowledge of face form that can be applied in practice.

The use of a clinical camera in our office has made it possible to demonstrate

to our patients, by means of full or half size photographs, improvements in facial appearance that they would hesitate to believe possible without this positive evidence at hand. There are many uses for these photographic records as the case proceeds.

Other preoperative records that are often very valuable are study models to show size, form and relation of the teeth and gingival tissues; profile guides, made either with wire, plaster, cutouts from natural size photographs or with the roentgen ray, to be used to check up foreshortening or change in these dimensions, and shallow impressions into which to fit the extracted teeth; and caliper measurements from nose to chin, from nose to cutting edge of upper central incisors, from chin to cutting edge of lower central incisors and from under the mandible to the occlusal surface of the lower first molar.

SELECTION OF ARTIFICIAL TOOTH COLORS

After years of careful observation and tabulations, one of us (E. B. O.) has discovered a solution of the perplexing question as to how to choose a harmonious color or hue for the edentulous case.

The complexion colors are a reliable basis of selection, when divided into two general classes, the yellow and the gray groups. In the yellow group belong the red, pink and creamy or deep yellow complexions; in the gray group, we find the olive, swarthy, tawny and brown complexions.

In the yellow group belong nearly all blondes, most of the red haired people with their typical reddish complexions and a great many with dark hair and eyes, or in other words, all those in whose complexion red or yellow predominates.

In the gray group are those who have a predominating gray, brown or olive color. Here we usually find the people with dark hair and eyes, but sometimes blondes may also belong to this group. Red and brown haired individuals whose pigmentation has darkened as age advances belong to this group.

Exposure to sun and wind sometimes temporarily changes the pigmentation, also disease, worry, fatigue, etc. These conditions must be taken into consideration in the study of the case.

With the foregoing as our foundation, we now turn to our hue guide and select the ones that will give us the degree of saturation or intensity of color to best suit the individual. The numbers from the one guide that harmonize with each group are as follows: seven yellows, 5-8-9-15-16-20-21, that will prove satisfactory in nearly all cases within this group, but occasionally we may wish to use 7-14 and 25.

The grays are 10-11-13-19, with a less frequent use of 12-17 and 18.

Another manufacturer's color guide would read: grays from 1 to 7 inclusive; yellows from 8 to 15. Sixteen to 19 have a more marked red or deep pink hue.

No serious disharmony will result if we are careful to remain within the group limits in the selection of hues.

The lighter the complexion, in either group, the less saturation of color in artificial teeth is indicated. As age advances, the saturation of color or pigmentation increases and we must use the darker hues on our hue guide. Age 60 requires a deeper saturation than age 40.

The examination for hues should

always be made in the most favorable light conditions, never in bright sunlight or under artificial light, but in the soft light of a clear day, preferably between the hours of 10 and 3.

A discussion of this work on color is given elsewhere in greater detail.[1]

DISCUSSION

A. K. Parks, Montgomery, Ala.: We must have in mind that we are dealing with the artificial; and that so-called artificial reproductions of subjects are seldom facsimilies of those subjects but are depictions of the impressions conveyed by those subjects. For that reason, the color that will harmonize with the hair, eyes and complexion of the patient is not always the best one to use. Take two prints from a negative of a scene. Tint one with blues and greys, the other with gold and yellow. The lines in the two are identical, but the impression conveyed by one is darkness or death—the other light and life. The same holds true in the basic color of teeth to be used in any case, regardless of what the color of the natural teeth were or what the complexion, etc., is. The same holds true in shaping and molding the features and outlines of the face. We must think of the impression conveyed to the casual observer by those features rather than the actual shape of the features. Many good looking people make a poor showing in a photograph because the camera sees the actual—the eye sees the impression made by assembly of the several features. Unfortunately, we are seldom able to make radical changes except in the lower third of the face. But fortunately changes in the lower third frequently produce an illusion which is equivalent to having changed the whole for the better. This can be illustrated by drawing two faces exactly alike and without mouths. Draw a mouth in one with the corners turned up and in the other with the corners down and note the seeming difference in the expression of the eyes, which of course are really unchanged. Fortunately for us, the mechanics and esthetic effects in most cases are brought about in the same way. Dentures with proper thickness and adaptation at the borders for retention and with centric occlusion registered at the correct lateral and vertical position are those that produce the best esthetic effect.

R. O. Schlosser, Chicago, Ill.: In the problem of denture construction, the appearance of the patient and his comfort should not be separated. An ill-fitting denture will not be worn. I know that any attempt to enhance the aesthetic is not going to force the patient to stand discomfort or misery for any length of time. Comfort and efficiency spell service. I have heard a great deal about the lips being a factor of the contour, but we can fix the position of the lips by the support given. By photographs, we can show the effects to the patient of the change. I find that a mirror will show the patient as much as a photograph. I always insist on keeping the old dentures so that when the argument arises, "these dentures do not make me look as when I had the old teeth," place the old in the mouth and then the new, so that the patient may see the comparison. I cannot quite agree with Dr. Bruening and others who have advocated aesthetics as far as they have. I want to do everything to help the patient, but first, last and all the time, I want to serve him in mastication.

1. Owen, E. B.: A Study of the Human Complexion and a Means of Determining Hues and Shades in Edentulous Cases, J.A.D.A., 12: 944 (Aug.) 1925.

NORMAL AND PATHOLOGIC ANATOMY OF THE INVESTING TISSUES RELATIVE TO CHRONIC PERICEMENTITIS*

By WILLIAM G. SKILLEN, D.D.S., Chicago, Illinois

A REVIEW of the literature concerning chronic pericementitis unfortunately indicates that the deductions of many authors are based upon studies of material in advanced pathologic condition. Since cause and effect are so closely interwoven, such material does not lend itself particularly well to determining either the etiology or the cycle of changes that occur. Therefore, a study of the anatomy of the investing tissues showing both the normal condition and the earliest possible pathologic changes should be of great value.

The dearth of human material, especially that which is normal in character or which shows early pathologic change, and the abundance of this material in animals, has prompted this study. It is hoped that, as time goes on, sufficient human material will be available with which to make comparisons. This report, then, will deal almost entirely with conditions observed in dogs.

The literature on the subject of chronic pericementitis is so immense that it is being prepared for separate presentation. Only such references as are particularly pertinent to some of the points emphasized here, therefore, will be mentioned.

NORMAL ANATOMY

At the present time, especially in Germany, much interest is being manifested in regard to what constitutes the normal anatomy of the gingivae as it relates to chronic pericementitis.

It is customary to consider the normal gingival space or crevice, as described by Black[1] and later by Box,[2] as extending to the amelocemental junction or gingival line, and to average about 2 mm. in depth.

In Germany, Kranz and Flack,[3] for instance, insist that this description is correct. Others differ more or less

*The discussion of papers by Drs. Skillen, Simonton, Wolbach and Howe will be found on page 1596.

*Read before the Section on Histology, Physiology, Pathology, Bacteriology and Chemistry (Research) at the Sixty-seventh Annual Session of the American Dental Association, Louisville, Ky., Sept. 22, 1926.

1. Black, G. V.: Special Dental Pathology, 1920, p. 7.

2. Box, H. K.: Studies in Periodontal Pathology, Canadian Dental Research Foundation, 1924.

3. Kranz and Flack: Alveolar Pyorrhea, Vertag H. Meusser, 1922.

with this view. Gottlieb,[4] and Orban and Kohler,[5] believe that the gingival crevice, or pocket as they call it, for a time at least does not exceed a millimeter in depth, although the crevicular epithelium extends to the gingival line. According to these men and others, the further deepening of the crevice, even

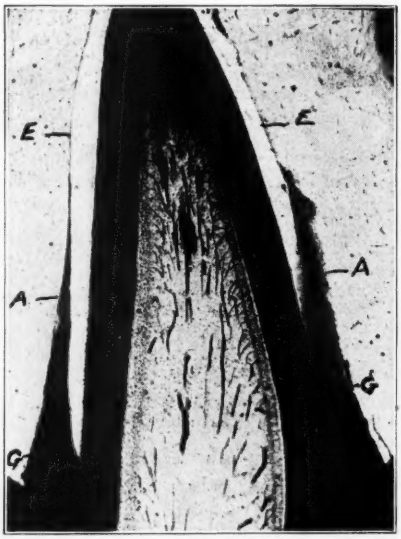

Fig. 1.—Cross-section of tooth of pig, showing continuation of the enamel cuticle *E*, with the gingivae *A*. *G*, gingival line.

beyond the gingival line, is a gradual process due to causes that may be considered either physiologic or abnormal. Weski[6] does not believe that a crevice should exist normally, but considers its formation to be due entirely to tearing.

Thomas[7] and Fischer[8] have suggested that the origin of the epithelium on that surface of the free gingivae adjacent to the tooth, and called by Box the cre-

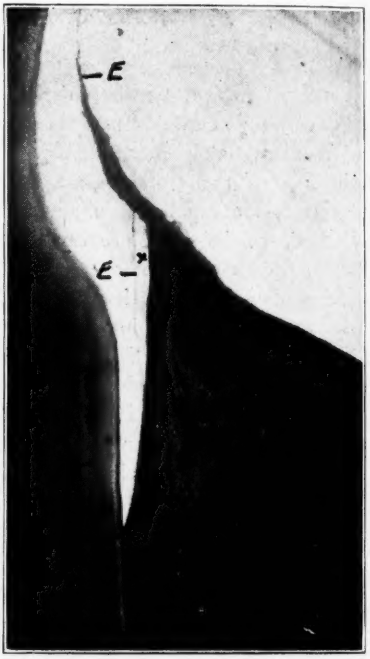

Fig. 2.—Normal specimen from a dog. *E*, enamel cuticle; *G*, gingival line; *X*, considered to be an artefact.

vicular epithelium, is from the enamel organ. A photomicrograph of the developing tooth of the pig shows that, apparently, the enamel cuticle forms

4. Gottlieb, B.: Vierteljahrsschr. f. Zahnheilk. 1922, p. 273; Zeitschr. f. Stomatol. 7: 458.

5. Orban and Kohler: Zeitschr. f. Stomatol., 1924, p. 360.

6. Weski, O.: Vierteljahrsschr. f. Zahnheilk., 1922, p. 1.

7. Thomas, N. G.: Observations on the Development and Function of the Enamel Organ, J.A.D.A., 12: 255 (March) 1925.

8. Fischer, Guido: Bau und Entwickelung der Mundhohle Anat., 1902.

a part of the crevicular epithelium. Our material further indicates that, in the pig, up to the seventh day after birth, the enamel cuticle is attached to, and continuous with, not only the crevicular epithelium, but also the extra-oral epithelium of the gingivae. No gingival crevice exists, therefore, in this material. (Fig. 1.)

In specimens from the adult dog, the same conditions are perhaps just a little less conclusive up to the present time, because of faults in the material that have developed during its preparation. In spite of the tearing of the tissues that has occurred, there is every appearance that conditions similar to those observed in the pig specimens may exist; or, at least, there is every appearance that the bottom of the gingival crevice does not extend to the gingival line. In all the normal specimens, (Fig. 2, 3 and 4), and in many of the pathologic ones (Figs. 18, 22 and 25), the enamel cuticle, or what appears to constitute the enamel cuticle, still remains attached to the crevicular epithelium for a greater or less distance above the gingival line. In one or two of the normal specimens (Figs. 2 and 3), there are indications also that the

Fig. 3.—Normal specimen. *E*, enamel cuticle; *G*, gingival line; *X*, artefact.

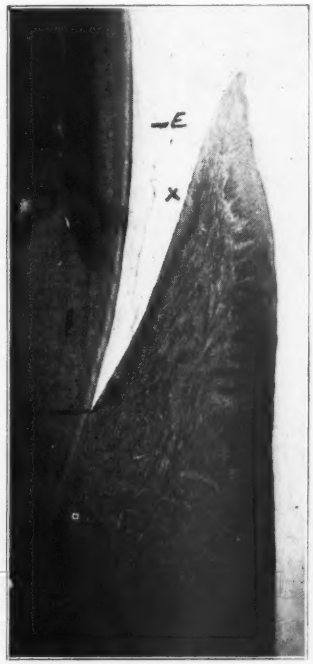

Fig. 4.—Normal specimen. *E*, enamel cuticle adhering to enamel remains; *G*, gingival line; *X*, artefact.

former is continuous with the extra-oral epithelium. All in all, the evidence seems to favor Weski's interpretation: that normally, strictly speaking, there should not exist a gingival space or crevice.

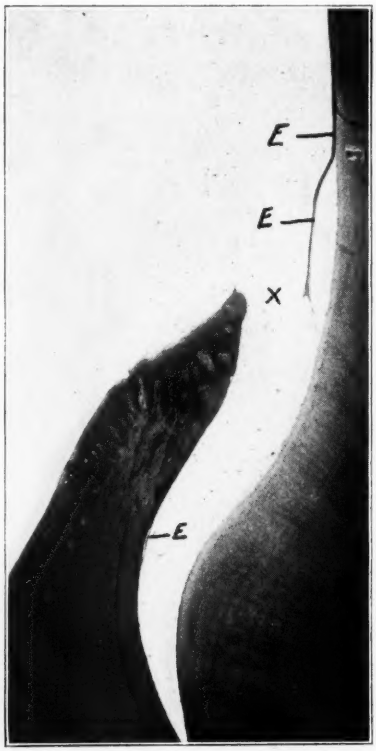

Fig. 5.—Normal specimen. *E*, enamel cuticle which has not been stripped from the crevicular epithelium; *X*, artefact.

It may be assumed, with some accuracy, that a physiologic dissolution of the epithelial continuity, due, say, to a chemical change, may take place; or that such a change, combined with the other demands of the situation, will result in the formation of a gradually deepening crevice. But whether or not such separations can be considered normal is a question. Obviously, the attachment, if it exists, is only a cellular one, and so is comparatively easy to tear.

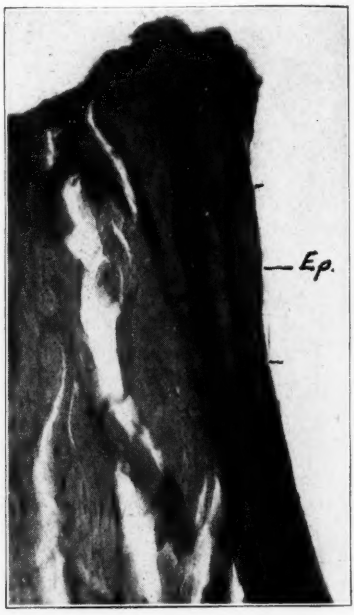

Fig. 6.—Normal specimen. At *Ep*, the crevicular epithelium consists of only two layers of cells.

Theoretically, depending somewhat on the causes behind it, a forced separation will follow such a line as may or may not give rise to more or less untoward results.

Box has shown that the crevicular epithelium is frequently extremely thin, affording little covering for the underlying pericemental tissue and circula-

tory vessels. It would appear to be better, from the evidence of the specimens examined, to consider this a typical normal arrangement rather than just a frequent occurrence. Practically all the specimens studied so far, if they have not been cut obliquely or if changes have not already set in, show one or more areas of the surface covered by an extremely thin layer of epithelium. (Figs. 5 and 6.)

If, then, the separation of the crevicular epithelium from the enamel cuticle does not follow such a line as will leave a protective layer of cells over these circulatory vessels and over the pericemental tissue in which they lie, an unfavorable, if not an ungovernable, condition is the result. The thinness of the epithelial covering enhances the danger of this. Such a condition Box illustrates, and, although viewing it un-

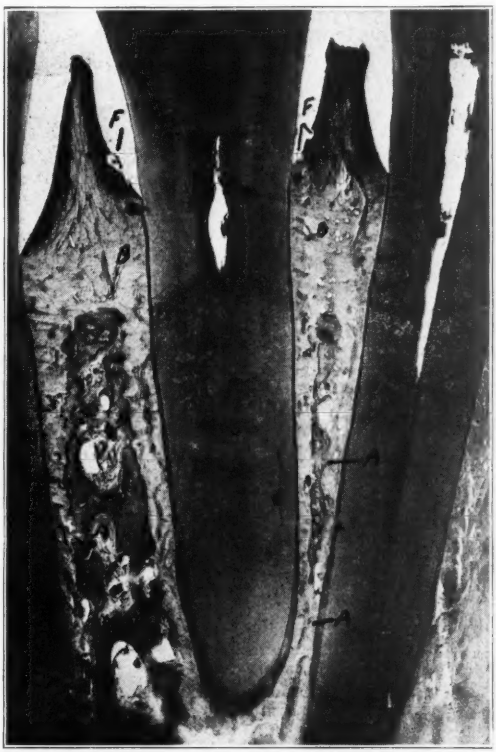

Fig. 7.—Specimen showing no pocket. *F*, foreign body in crevicular epithelium (compare Figure 8); *A*, absorption of process partly due to drifting of adjacent tooth; *B*, hyperemia. Figures 7-26 show pathologic specimens.

favorably, appears to consider it a normal arrangement. It does not appear possible that, normally, connective tissue and circulatory vessels would lie exposed and unprotected. Rather, this arrangement as described by Box, appears to be the result of such an occurrence as has been pointed out above, the sequence of which obviously would be inflammation, and perhaps bacterial invasion.

On the other hand, it may also be assumed that, even if the underlying structures are not exposed or injured by the forced separation or tearing of the epithelial tissue, but the latter only is injured, unfavorable conditions may still be set up. It is conceivable that an injury or irritation may be such as to incite and maintain the process of cell multiplication, the proliferating epithelium, like other similar growths, invading the underlying pericemental tissue, displacing the fibers and destroying their function. This leads to pocket formation and atrophy of the alveolar process.

That epithelial proliferation may have such far-reaching results is rather a new concept in this country, but one not to be overlooked. Box approaches it in his description of its potency in relation to the formation of the cemental-gingival pocket, and it is noticeable in most of the pathologic specimens to be described here. (Fig. 26.) In Germany, it is receiving considerable

Fig. 8.—*F*, foreign body; *Ep*, epithelial proliferation; *C*, endothelial proliferation (common early changes).

Fig. 9.—Specimen from a deep pocket. *F*, foreign bodies surrounded by proliferating epithelium, which extends to the bottom of the pocket; *I*, leukocytic infiltration; *P*, pericementum; *Ce*, cementum.

attention from those men already mentioned, and others. At least, it seems to be fairly well established that epithelial proliferation, in many cases, is contributory at least, in the formation of the pocket and the resulting bone atrophy.

stances, has its beginning in the gingivae, permits of no argument.

ETIOLOGY

In most of the specimens so far studied which show pathologic changes, the conditions that exist seem to be en-

Fig. 10.—Specimen showing no pocket. *F*, foreign body; *D*, food impaction; *H*, calculus; *A*, absorption. (Compare Figure 11.)

All in all, the evidence is such as to indicate that possibly there still remains something to be learned in regard to the normal anatomy of the gingivae. That this knowledge is essential to the prevention of chronic pericementitis, which, in the greater majority of instances, is entirely due to injury of the gingival tissues. It is readily admitted that, behind these injuries, other causes may lie, but, with some exceptions, the former are the only ones to be seen. In most of the cases, this injury has been caused by foreign bodies, resembling

hairs in some instances (Figs. 8, 9 and 11), which, entering the gingivae, either lodge there or pass on into the surrounding tissues for a greater or less distance. (Figs. 12 and 13.) In others, the injury has apparently been caused, and the inflammatory reaction

Fig. 11.—*F*, foreign body; *Ep*, epithelium.

kept up, by food impaction or traumatism of the gingivae. (Fig. 14.)

It is interesting to note that Gottlieb[4] found a very prevalent cause of chronic pericementitis in the rat to be animal hairs, as well as hairs from the oats that formed their principal food. Quite similar causes are found in the dog. This should be interesting to those who are performing dietary experiments on animals. It would seem evident that such a predisposing cause, or an existing pathologic change resulting from such a cause, would develop rapidly under a state of lowered general resistance.

In those cases in which food impaction or traumatism was indicated as being the cause, many of the teeth were malposed, either having open contacts

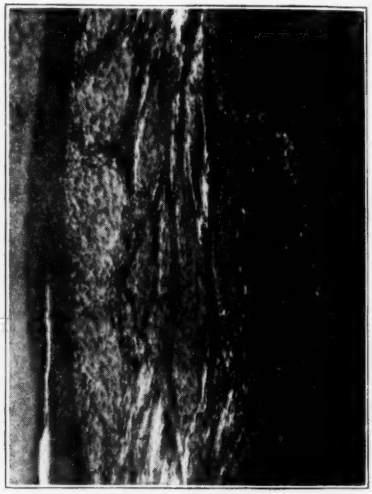

Fig. 12.—Foreign body deep within the pericementum and surrounded by leukocytes.

or being out of alinement. The latter usually showed more or less abrasion. Here, then, are three things to take into consideration in determining the etiology of these cases: (1) the effect of the possible traumatic occlusion in instigating changes and lowering the resistance of the investing tissues; (2) the obvious probability that the abnormal arrangement of the teeth will be accompanied by an abnormal arrangement of the gingivae, making them more vulnerable to injury, and (3) the pres-

ence of impacted food. In the final analysis, of course, the injury is the direct cause of the inflammatory changes that are taking place. The

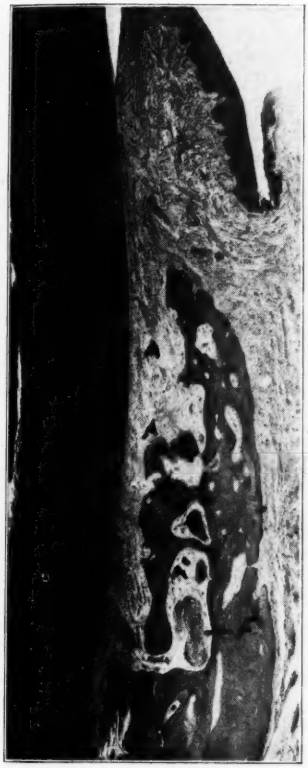

Fig. 13.—*F*, foreign body deep within the alveolar process, surrounded by leukocytes; *A*, absorption; no pocket.

hope of being able to observe the results of traumatic occlusion, so far, has not been realized.

All this illustrates the intricate manner in which cause and effect become interwoven, and the difficulties of interpretation. In some instances, in the absence of something definite, and especially in the absence of cumulative evidence, it has been impossible to determine either cause or effect, even though the specimens are in an early stage of change. These are being reserved for further consideration.

Fig. 14.—Result of traumatism. *I*, polymorphonuclear infiltration; *X*, may be anything, but appears to be undergoing absorption.

PATHOLOGY

In all the specimens so far studied, the pathologic changes that have taken place involve, to some extent, all the investing tissues—the gingivae, pericementum and alveolar process, even when, clinically, there was no evidence of pathologic change.

The changes are the result of a subacute or chronic type of inflammation,

induced or maintained by the causes outlined in the preceding paragraphs. On the whole, they correspond quite closely to those changes observed and described by Box under the head of chronic periodontitis, and so will require little explanation here. No suppurative types have been observed so far,

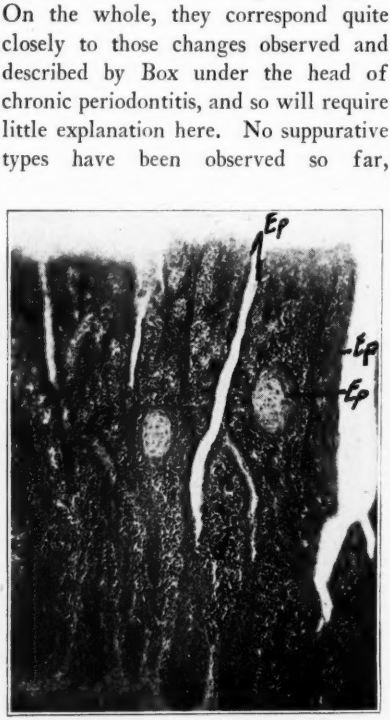

Fig. 15.—Result of traumatism. *Ep*, proliferating epithelium and cell nests; *I*, plasma and round-cell infiltration.

although, in some of the advanced cases, suppuration of the contents of the pocket has occurred, without involving the underlying tissues. (Figs. 16 and 17.)

Before and during pocket formation, inflammatory changes in the gingivae are marked by epithelial proliferation and plasma and round-cell infiltration of the adjacent tissue. (Figs. 8, 15, 18 and 19.) Circulatory disturbances in the gingivae are indicated by hyperemia and endothelial proliferation. In those caused or maintained by food impaction, a more hyperemic condition of the tissues is observed, a condition that, clinically, probably would be termed a

Fig. 16.—Section showing three pockets. *D*, deepest point of detachment; *G*, gingival line; *S*, suppuration (compare Figure 17); *C*, crest of process. Extension of epithelium, *Ep*, in Pocket 1, may be noted.

gingivitis. Owing to desquamation of the epithelium, the vessels lies close to the surface, indicating that a slight touch would induce hemorrhage; also, in these cases, calculus formation seems to take place very early. (Fig. 22.)

These things, in a way, indicate that with the loss of epithelial covering, the serum or blood, present in copious quantities, readily escapes into the crevice or pocket and, with other material there present, becomes the nucleus for calculus formation. It might be assumed, then, that the presence of calculus indicates that, back of its formation, lie other causes, which have been in operation for some time. In other words, it is a symptom instead of a cause.

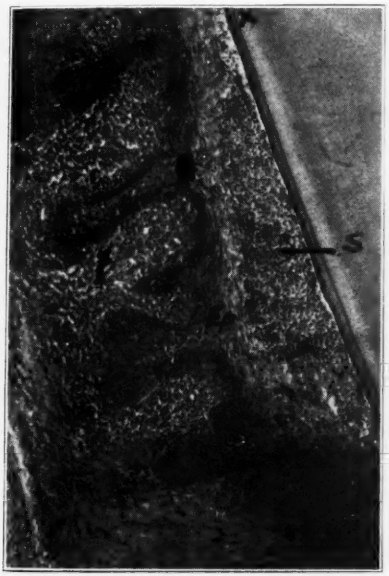

Fig. 17.—Suppuration within the pocket, *S*, with no suppuration in the tissues; *Ep*, proliferating epithelium adhering to cementum above *X*; *I*, infiltration.

Those cases which apparently have been caused by foreign bodies, and in which there is not a further involvement from food impaction, do not have the inflamed appearance of the preceding ones, nor does calculus appear in the earlier stages. In these, endothelial proliferation is the principal circulatory change to be seen.

It has been mentioned that, as yet, no specimens have been obtained in which the pericementum, and especially the alveolar process, are not involved to some extent.

Fig. 18.—Early gingival change, with no pocket. *Ep*, proliferating epithelium; *I*, infiltration; *C*, endothelial proliferation; *?*, enamel cuticle.

Inflammation of the pericementum is principally indicated by endothelial proliferation and, somewhat later, by possibly a slight increase in the interstitial tissue that surrounds the vessels. Not until an actual pocket is formed

is there ever a leukocytic infiltration of this tissue. There have been some slight indications that possibly a hyaline degeneration of the fibers of the pericementum might be taking place, but it is not certain whether this appearance is an actual change or is due to the technic employed.

seen. Absorption of the bone trabeculae and absorption along the pericemental border begins very early and are very noticeable. Regions of the bone tissue also appear to be undergoing condensation.

Occasionally, in a specimen, the loss of alveolar process was out of all pro-

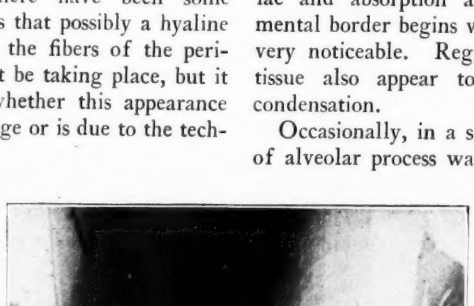

Fig. 19.—A very early change; *Ep*, proliferation of epithelium (distance from point of injury, *F*, probably a foreign body, may be noted); *I*, infiltration; *G*, gingival line.

The early effect of inflammation on the alveolar process is very noticeable, not so much at the crest as deep down in its tissues, even as far as the apex of the tooth, and along the pericemental border. The vessels within the bone spaces are usually greatly congested, and leukocytic infiltration, more or less dense, of the medullary spaces can be

portion to the rest of the pathologic change present. For a while, this seemed to indicate that the seat of the trouble lay in the bone, although the gingival lesion was plainly to be seen. The cause of this was finally discovered to be due to one, or both, of two things: the lodging of foreign bodies deep within the pericementum or bone (Figs.

12 and 13), or the drifting of one or more teeth that were so extensively involved as to have lost their means of support. (Figs. 7 and 21.) The drifting of such teeth induces a remodeling of the alveolar process around adjacent teeth, which is not always limited to the immediate adjacent ones, but may, apparently, extend to others in the neighborhood, so that the effect is rather widespread. The process of absorption so set in motion often predominates, probably becoming augmented by a reduced functional ability and injuries induced by anatomic disturbances.

With all these changes going on almost simultaneously, the difficulty of determining correctly the cycle of events, or whether one, or all of them together, induces pocket formation, can be appreciated. This much seems to be true: No material reduction in the height of the alveolar process precedes actual pocket formation. (Figs. 7, 10, 13, 21 and 22.) Also, no material change can be noticed in the pericementum that might indicate that the fibers composing this tissue were losing their vitality and were about to be cut off from the cementum. The advanced case sometimes may have this appearance, or at least, a cellular activity, which may be observed, may indicate that some change is about to occur. The first thing that seems to indicate that a pocket is about to form is the invasion of the pericementum by the proliferating epithelium. This invasion usually follows along the surface of the cementum and may extend considerable distances before actual separation from the cementum occurs. (Figs. 16, 19, 23 and 26.)

Epithelial invasion, then, seems to be, at least, a contributory cause of pocket formation. It always seems to be in advance of pocket formation, even after a deep pocket is formed. (Fig. 24.)

Following the epithelial invasion of the pericementum and keeping in close step with it, leukocytic infiltration of the underlying tissue takes place.

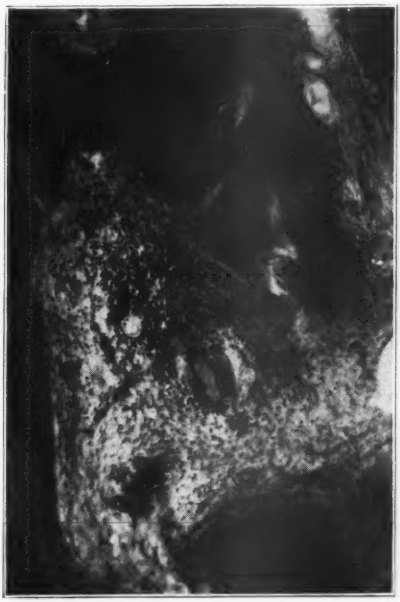

Fig. 20.—A condition present in the alveolar process rather early; leukocytic infiltration. (Taken from a specimen shown in Figure 7.)

The sequence of change, then, which, as indicated by these specimens, seems to take place, is (1) an epithelial invasion of the pericementum, quickly followed by leukocytic infiltration of the adjacent tissue, and (2) separation of part of the infiltrated tissue from the cementum. Coincident with the invasion and infiltration, absorption of the crest of the alveolar process occurs.

In advanced cases, epithelial proliferation, as Hatton[9] and Gottlieb[4] have already shown, has been such as, more or less, to cover completely the denuded pericementum, and even to extend beyond the furthest point of detachment. (Figs. 16, 21 and 24.) This fact should emphasize the improbability of obtaining reattachment of the pericementum after the usual method of treatment.

In one instance, the proliferating epithelium was diverted from the usual path along the cementum. It passed more deeply into the pericementum, in which position the epithelial strand split, forming a cystlike cavity filled with fluid, leukocytes and other cells.

Fig. 21.—Early changes about Teeth 1 and 2, and extensive pocket formation about Tooth 3. Some of the bone absorption between 1 and 2 is due to the drifting of Tooth 3. Epithelium completely lines the deep pocket. *V*, thickened vessel.

Box has remarked the interesting phenomenon of epithelial adhesion to

9. Hatton, E. H.: Bull. Chicago Dental Society, 4: 3, (Feb. 22) 1924.

cementum subsequent to treatment. The same thing can be seen in specimens which have received no treatment and in which extensive pocket formation has occurred. (Figs. 16 and 24.)

Fig. 22.—Impacted food and foreign bodies present in gingivae; early changes, and no pockets. *V*, vessels considerably thickened; *C*, slight loss of bone from the crest of the process; *H*, calculus; *E*, enamel cuticle.

There are only two feasible explanations for this: that the pericemental fibers with which the epithelium has mingled still remain attached or that calculus is forming and is including in its substance some of the surface layers of the epithelium. This, however, is, on the whole, guesswork. It does appear sometimes, as has already been intimated, that cells adhere to and enter into the composition of calculus, and it also has been mentioned, as Box and others have described, that the epithelium remains close to the cementum in the early stages of pocket formation, probably because it has invaded the fibers before they were detached.

SUMMARY

In the cases so far studied, the noticeable cause of the pathologic changes

that have led or are leading to the development of chronic pericementitis has been injury to the gingivae, usually the crevicular surface.

These injuries may have been preceded by an alteration in tooth or gingival arrangement, making the gingivae more vulnerable to injury. This especially applies to food impaction.

Foreign bodies, sometimes resembling hairs, constituted other injurious agents, when lodging in the gingivae or other investing tissues.

The etiology is extremely difficult to determine, as innumerable things, often difficult or impossible to observe, may enter into it.

Fig. 23.—Cystlike cavity developed in the proliferating epithelium. Insert: Section taken from another level. *Ep*, epithelial invasion proceding pocket formation; G, gingival line.

Fig. 24.—Area from a deep pocket showing epithelium, *Ep*, covering denuded tissue and adhering to cementum.

All the investing tissues, but especially the alveolar process, are early involved to some extent, even when there is no clinical evidence, and before a pocket is formed. These early changes in the bone tissue are rather diffuse, but do not materially alter the height of the process.

Epithelial invasion of the pericementum is apparently the first indication of

pocket formation, and may extend considerable distances before actual separation occurs.

With the invasion of the epithelium, absorption of the crest of the alveolar process takes place, so that, when an actual pocket is formed, the crest lies at a relatively lower level.

Epithelial invasion alone may induce pocket formation, and as little irritation may be needed to start this, the crevicular surface of the gingivae should receive careful attention.

There are indications that something remains to be learned in regard to the anatomy of the gingivae, possibly of sufficient importance to compel us to modify some of the procedures in use today.

Fig. 25.—Desquamation of epithelium *Ep*, *en masse*; no pocket; enamel cuticle, *E*, adhering to enamel remains and not entirely separated from the crevicular epithelium; slight infiltration.

Fig. 26.—Invasion of the pericementum by proliferating epithelium. *G*, gingival line; *V*, thickened vessels. Absence of change in pericementum *P*, may be noted.

That many other conditions and results are possible is not denied, for, as yet, only a small portion of an extremely large amount of material, rich in possibilities, has been touched on, and it is perfectly obvious that a study of specimens in still earlier stages of change would be advantageous.

PROGRESS REPORT OF THE CALIFORNIA STOMATOLOGICAL RESEARCH GROUP*

By F. V. SIMONTON, D.D.S., San Francisco, California

A RESEARCH group has been organized at the University of California, which has for its major objective a solution of the etiology of pyorrhea. This group has evolved from a small nucleus of men who, in 1921, undertook experiments at San Quentin Prison in an effort to gain further insight into the effects of conservative treatment of diseases of the investing tissues. The development of the group since that time has been such as to focus its attention more and more specifically on etiologic studies.

The early judgment of the group favored a deployment, or spreading out, for the purpose of delimiting the problem, and in a search for clues. When the hoped-for goal is reached and the cause of pyorrhea has been revealed, it is possible that certain of the aspects on which we now dwell may be shown quite fortuitous and certain observations inconsequential. But while so much remains obscure, it behooves us scrupulously to endeavor not to overlook any data. We cannot forsee from whence valuable clues may arise. There must also be considered the point of view that the cause of a disease may lie in a complex in which many factors participate, rather than in a simple cause. If such should prove to be the case, it will follow that no data have been gathered in vain. There are four great classes of disease: those arising from (1) infection, (2) malnutrition, (3) trauma and (4) abnormal conditions of the endocrine glands. There may also be other classifications at present unknown; or, to express this statement in a different way, certain diseases the causes of which are not understood may be found to belong to some category not yet recognized.

When the evidence indicates that a disease is of infectious origin, or the manifestations of the disease are characteristic of such an origin, a direct effort can be made to discover the germ responsible. In the case of pyorrhea, the data were not adequate to justify its assignment to any one class of disease. Our task, therefore, has been twofold. It was necessary to assign pyorrhea to some one of the classes of disease, if, in fact, it could be so restricted; and, secondly, it was necessary to pursue studies in the class which, in our judgment, at a given time showed the greatest promise and to intensify such studies if the growing evidence confirmed our judgment.

The group has been conducting studies in: (1) protozoology, (2) bacteriology, (3) histopathology, (4) biochemistry, (5) dentistry, (6) medicine.

PROTOZOOLOGY

Each of the three main divisions of micro-organisms are represented in the mouth and may be present in pyorrheal

*The discussion of papers by Drs. Skillen, Simonton, Wolbach and Howe will be found on page 1596.

*Read before the Section on Histology, Physiology, Pathology, Bacteriology and Chemistry (Research) at the Sixty-Seventh Annual Session of the American Dental Association, Louisville, Ky., Sept. 22, 1925.

infections. They are: (1) animal parasites; protozoa; (2) intermediate forms; spirochetes, and (3) plant organisms; bacteria, and fungi. Although several species of protozoa have been mentioned in the literature as occurring in the mouth, only one, *Endameba gingivalis*, has been regarded as important. Some years ago, attention was centered on this organism as a possible specific etiologic factor. The theories failed of confirmation. Evidence both biologic and clinical was advanced to show that the ameba of the mouth was not responsible for pyorrhea.

It must be recognized that authorities disagree on this question. Furthermore, some of the most skeptical admit that the last word has not been said on the significance of this organism in the mouth. The clinical negation of the hypotheses of Barrett and Smith, Bass and Johns, as far as based upon the ineffectualness of emetin therapy is invalidated by the fact that this drug is not a specific for the oral ameba.

Since certain important questions concerning this organism were waiting an answer, and since unusually favorable opportunities existed at the University of California for an exhaustive study of it, several projects were gotten under way.

Amebae had been reported in the bone marrow in Ely's second type of arthritis deformans. Removal of abscessed teeth is recommended for the relief of arthritis in some cases. It is important, therefore, to ascertain whether the amebae of the mouth involve tissue elsewhere and if the ameba of the bone marrow is that of the bowel or of the oral cavity.

There are certain important questions relative to the feeding habits of *Endameba gingivalis*. Does it feed on red blood corpuscles, or white blood corpuscles? Are bacteria a necessary element in its pabulum? Again, the association of oral amebae with filaments of leptothrix and the secretion by the latter of salts of lime is of considerable interest in reference to dental calculus. It should be noted in this connection that filamentous bacteria are associated with deposition of salts of manganese, iron and calcium elsewhere in Nature.

Although amebae have not yet been demonstrated in the periodontal tissues, such a possibility still remains open. The histopathologic picture of pyorrhea has been reported to parallel rather closely that accompanying invasion of other tissues by *Endameba histolytica*. Finally, the ameba, through its presence or through enzymes liberated at its death, may act as a local irritant.

The ameba of the mouth has been differentiated from that of the bowel and tissues by careful morphologic study, upon the basis of difference in nuclear structure.[1] Both amebae have been distinguished from human ameboid cells by a critical counting of their chromosomes. It has been shown that the ameba of the human bowel, from culture animals, human bone marrow, liver abscess, sputum in lung abscess, lymph glands, the wall of the colon and skin ulcers is *Endameba histolytica* and that the portal of entry is through ulcers of the colon. The amebae of the mouth feed on salivary corpuscles, consisting mainly of the nuclei of leukocytes. The amount of bacterial feeding is so small as to appear contaminative rather than selective.

In the course of these studies, success

1. Kofoid, C. A., and Swezy, Olive: Cytology of Endamoeba Gingivalis, J.A.D.A., 12: 197-202 (Feb.) 1925.

has been achieved in growing *Endameba gingivalis* in artificial culture.[2] This accomplishment has made it possible to study the reaction of the organism to environmental influences. Reports on this work are now in press.

BACTERIOLOGY

Spirochetes.—Since these organisms have been carefully studied, as far as present cultural methods permit, and the results proved negative, the group has not undertaken any direct studies of them. From the clinical standpoint, treatment of pyorrhea cases with such spirocheticides as arsacetin, stovarsol and neo-arsphenamin, both intravenously and orally, failed to effect any improvement. The spirals could be caused to disappear from the gingival sulci, but, in all cases, they returned a short time after treatment was discontinued. As stated, no clinical change in the appearance of the pyorrheal lesions or in the amount of pus present could be seen.

The group has not been able to confirm the findings of Kritchevsky and Séguin relative to the presence of spirals in the tissues. With suitable stains, spiral-like bodies could be seen, but they proved to be artefacts.

BACTERIA

A study of the literature reveals an enormous mass of material devoted to the bacteriology of pyorrhea. The most notable omissions in the literature appeared in relation to the anaerobic bacteria and the bacteriophage.

The Anaerobic Bacteria.—A study of the anerobic bacteria, which could be cultured, showed:[3] (1) that sporulating anaerobes are not commonly found, and (2) when they are found, it is usually impossible to detect the same species in subsequent specimens from the same mouth.

Of fifty-six specimens of saliva from forty-three individuals, only six yielded sporulating anaerobes, including *B. welchii, B. bifermentans, B. tetanomorphus,* an unidentified nonpathogenic organism and a strongly toxicogenic, *B. tetani.* Attempts to prove the continual residence of any of these organisms in the mouth failed. There was likewise no correlation of these findings with dental conditions.

Aerobic spores were also encountered in sixteen specimens, but not identified, owing to the present unsatisfactory status of their taxonomy. Both aerobic and anaerobic sporulating bacteria appear to be transient saprophytes and of no direct pathologic significance in relation to pyorrhea.

A minute gram-negative nonsporulating obligate anaerobe, designated as *Micrococcus gazogenes* was found of almost universal occurrence. Two serologic strains were demonstrated. Although human beings not infrequently produce low-grade agglutinating serums, the strongest of which come from persons free from gingival lesions, the occurrence of the organism could not be correlated with clinical conditions in the mouth.

The Bacteriophage.—Whether or not the saliva possesses germicidal powers or inhibits bacterial growth has long been debated. Work in this field dem-

2. Howitt, Beatrice: Cultivation of Endamoeba Gingivalis, University of California Publications in Zoology, Vol. 28.

3. Hall, I. C.: Bacterial Factors in Pyorrhea Alveolaris, III. The Isolation of B. Tetani, B. Welchii and Other Sporulating Anaerobes from Human Saliva, J Infect. Dis., 37: 87-92 (July) 1925.

onstrating the existence of a protective factor in the oral cavity is now in press.[4] The presence of this bacteriophage has shown an interesting correlation with clinical dental conditions.

Mass Reaction Changes.—Studies of the changes in hydrogen ion concentration associated with bacterial activity in the saliva *in vitro* have revealed characteristic reaction curves.[5] The possible relation of such reaction changes, where protected in stagnation areas from the buffering effect of carbon dioxid, to precipitation of calculus is still *sub judice.*

Antibacterial Therapy. — Studies made with the dark-field and smear methods[6] of the organisms, associated with pyorrhea before and during the course of treatment by the conservative method, have revealed a rapid diminution of micro-organisms in the following sequence: long bacilli, spirals, staphylococci, streptococci and short bacilli. Fusiform bacilli and diplococci are but little affected. Results secured through treatment of cases by vaccines and bacterins and by injections of sterile protein are soon to be reported.[7]

Immune Factors.—The presence of large mononuclear leukocytes or clasmatocytes has been demonstrated in the gingival exudate and their number shown to be directly proportional to the amount of inflammation.[8]

Histopathology.—Work already published[9] by the group indicates, among other findings that:

1. Although infectious processes may complicate and intensify pyorrhea, there is no adequate reason, at present, to ascribe the cause of the disease to any specific micro-organism. 2. Repair is a difficult process, attended by many interruptions. 3. The infectious agents penetrate the lymph channels by their own motility or proliferation as a result of lytic action on the walls of these spaces. Microbial forms may be seen in the lymph sacs. 4. The incidence of potentially and actively pathogenic organisms in the gingival sulcus is such that it is rare to find gum tissue that may be classed as normal.

In my opinion, these results, together with the generally negative aspect of the bacteriologic findings as regards pyorrhea, as well as certain positive findings through dietary experimentation, strongly suggest that pyorrhea belongs in the category of nutritional diseases. Further studies in histopathology, soon to be reported, contribute additional evidence to the support of this point of view.

Nutrition.—The positive results of studies of pyorrhea based upon nutritional experimentation, together with

4. Hall, I. C.: Recovery of the Bacteriophage from the Saliva—Its Relation to Oral Conditions, J. Infect. Dis., to be published.

5. Hall, I. C.: Bacterial Factors in Pyorrhea Alveolaris, I, J.A.M.A., 81: 1676-1679 (Nov.) 1923; Bacterial Factors in Pyorrhea Alveolaris, II, Dent. Cosmos 67: 115-124 (Feb.) 1925.

6. Beckwith, T. D.: Dark-Field Microscope in Pyorrhea and Oral Infections, J.A.D.A., 12: 1228 (Oct.) 1925.

Batchelder, A. P.: A Study of the Relation of Micro-organisms to Pyorrhea and Its Treatment, J.A.D.A., to be published.

7. Beckwith, T. D.: Studies of Possible Increase of Local Immunity in the Gum. (Unpublished data.)

8. Beckwith, T. D., and Morrison, L. F.: The Occurrence of Clasmatocytes in Oral Conditions Related to Pyorrhea, J.A.D.A., 13: 38 (Jan.) 1926.

9. Beckwith, T. D., Simonton, F. V., and Williams, Adrienne: Histologic Study of the Gum in Pyorrhea, J.A.D.A., 12: 129-153 (Feb.) 1925.

the suggestive data available as to racial differences in incidence of the disease, point to the field of nutrition as of major importance.

A survey of the dental conditions of 1,600 Mexicans and Whites has revealed distinctly better dental health in the former.[10] A racial difference in susceptibility is of importance in the study of the cause of a disease, for the cause, in whole or in part, will be found in the differences between such races (as they exist in their natural habitats). These differences will include such factors as habits, diet, climatic conditions and tissue chemistry. Efforts are now being made by the group to secure reliable statistics on the incidence of pyorrhea in different races.

A study of the medical and dental condition of fifty-seven prisoners at San Quentin revealed remarkably little disturbance through a dietary containing little of the vitamins, over a period of three years.[11] Practically all the food was cooked. Oranges appeared in the diet but twice in three years; fresh apples, four times; fresh tomatoes, thirty times; bananas, three times; chow-chow and fresh onions, three times. Butter was not served. Vitamin A was supplied only in corn products and in a very small amount of milk (approximately 1 ounce a day of the latter.) Vitamins B and C were probably supplied by beans and tomatoes.

On this small supply of vitamins, the prisoners apparently did as well, systemically and dentally, for the three-year period, as the ordinary person would on a much more varied diet, richer in vitamins.

It should be noted, however, that this evidence does not tend to controvert the findings of McCollum, Mendel and others, but rather to confirm them. McCollum points out that low-grade deficiencies of diet must act over a considerable time, even several generations, before producing appreciable effects. This study showed that the general health remained good and relatively few cavities developed in the teeth of men on a deficient diet, in three years. The number of cavities that developed was certainly no greater than would occur in the population of the outside world.

This finding tends to indicate that, whereas diets from which essential food factors have been wholly eliminated will produce lesions of the dental structures, as shown by Howe, Grieves, Mellanby and others, deficiencies of a less magnitude in adults require a long time to produce their effects.

The importance of a more complete understanding of mineral metabolism as related to the general subject of nutrition, as well as to pyorrhea and dental caries, led to extensive studies by the group in this field. A study of the inorganic constituents of the food excreta, blood and saliva of five men over a period of twenty-eight weeks has just been completed.[12] Studies of the organic constituents of saliva, with particular reference to the mucin, are now in progress.

Clinical Dental Studies.—Much difficulty has been experienced in perfect-

10. Stanley, L. L., and Simonton, F. V.: A Comparative Dental Study of Mexicans and Whites. (Unpublished data.)

11. Stanley, L. L.: Diet of Prisoners at San Quentin, J.A.D.A., 12: 161-165 (Feb.) 1925.

12. Clark, G. W.: Mineral Metabolism of Adult Men, J. Biol. Chem., 63: 20 (Feb.) 1925.

ing methods for determining and evaluating the amount of destructive change existing in a case of pyorrhea at any given time. This obstacle has been overcome by the perfecting of a measuring technic[13] and a recording system,[14] and by the design of a radiographic device.[15] This device now makes it possible to determine, with mathematical precision, the changes that take place in pyorrhea during the progress of the disease or in the course of treatment.

Previous to the perfecting of these methods, studies were made on the effects produced by combining certain adjunctive therapy with conservative instrumental treatment. One patient was given calcium lactate and cod-liver oil; another was subjected to endocrine therapy, and a third was treated locally with germicides. No improvement greater than that to be obtained by instrumentation alone could be detected. It is possible that continuation of these treatments over a long period and a refined measurement of changes might reveal improvements overlooked.

At the present time, cases are in course of treatment by conservative instrumentation, together with such adjunctives as (1) optimal diet, (2) treatment by quartz ray, (3) stimulation through requiring vigorous chewing exercises and (4) bacterin therapy. The results of these treatments are being checked by all the precision methods at our command.

During a period of three months, the soft tissues have undergone the most striking improvement in color and tone. Bone changes during this time are scarcely perceptible. Just how much change can be produced remains to be seen. It is certain that the changes will be slow. Previous work[16] has shown that the microscopic aspects of the tissue have undergone profound change from an active destructive state to an actively constructive condition.

We also know that the inflammation is materially allayed and the sepsis markedly reduced. In correlation with these studies, certain lesions of the teeth have been produced in dogs by experimental diets. Lesions that correspond with these both clinically and microscopically have been found in the mouths of rachitic children. These lesions are not dental caries. The conditions are characterized clinically by a peculiar zonation of the crowns of the teeth, presenting intact tips, discolored chalky intermediate areas and thin transparent gingival zones. The roots tend to be abnormally formed. Microscopically, the tip of the crown appears to be completely calcified; whereas, areas of later formation are either imperfectly calcified or completely uncalcified. The pulps show great vascularization, hyperplasia of the cellular elements, fibrosis

13. Simonton, F. V.: The Technique Involved in Measuring Destructive Changes of the Investing Tissues of the Teeth, J.A.D.A., 12: 448-453 (April) 1925.

14. Simonton, F. V.: An Examination of the Mouth With Special Reference to Pyorrhea, J.A.D.A., 12: 287-295 (March) 1925.

15. Simonton, F. V.: Roentgenographic Standardization with Special Reference to Pyorrhea Research. (Unpublished data.)

16. Simonton, F. V.: Results Obtainable Through Instrumental Treatment of Pyorrhea, J.A.M.A., 81: 2013-2014 (Dec. 15) 1923.

and degeneration of the odontoblasts. The tissue of the tooth is destroyed *en masse*, from without inward. Unlike dental caries, the condition progresses along a straight front, and not in flamelike extensions. It attacks surfaces immune to caries and fails to attack caries-susceptible areas. To this entity, we have applied the designation "odontoclasia." It is our opinion that the condition is more common than has been suspected. As far as we have been able to cover the literature to date, it has been noted clinically by only two observers, Dick and Broderick. The syndrome and its significance appear not to have been recognized heretofore. It seems to us that these cases must often have been mistakenly diagnosed as rampant caries.

The group has also pursued certain studies on focal infection,[17] and others are now in progress.

CONCLUSION

It may be stated that the gradually accumulating data appear to indicate that pyorrhea belongs in the category of nutritional disease. It is my opinion that the nutritional factor responsible is not that of deprivation of any essential constituent, but is due to some subtle lack of balance, probably of the inorganic elements.

This does not preclude the possibility of the clinical pictures being often and largely dominated by an infectious process. But it is believed that such infection, when it does occur, is superimposed on an initial predisposition, of nutritional origin.

17. Wisner, F. P.: Focal Infection, A Medico-Dental Problem, California & Western Med., August, 1925.

THE EFFECT OF A DEFICIENCY OF THE ANTISCORBUTIC FACTOR IN GUINEA-PIGS AND OF THE FAT-SOLUBLE A IN RATS*

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IN previous reports one of us has described gross changes in the teeth and bones of guinea-pigs and monkeys that have followed a deficiency of the antiscorbutic substance.[1]

During the past year, we have carried on experiments with guinea-pigs and rats on diets deficient in the antiscorbutic factor and fat-soluble A vitamin, respectively. Dr. Wolbach has made careful histologic examination of the teeth, bones and other tissues.

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*This constitutes a part of the work which has been carried out under grants from the American Dental Association, the Forsyth Dental Infirmary, Harvard University and the Massachusetts Dental Society.

1. Howe, P. R.: Studies of Dental Disorders Following Experimental Feeding with Monkeys, J.A.D.A., 11: 1149 (Dec.) 1924.

Young growing animals were used. Each animal was kept in a separate cage. They were killed by chloroform. The guinea-pigs were fed on a diet that previous experiments had shown would produce the scorbutic condition.

The earliest effect of the scorbutic diet, which is to be found in the incisor teeth, is evidenced by the manner in which the formation of the dentin is affected and in the changes in the layer of odontoblasts. The earliest changes may be observed in six or seven days. Among the most noticeable is the separation of the layer of odontoblasts from the dentin. The space left is presumably filled by a liquid. The odontoblasts undergo marked changes in size, arrangement and staining reaction. The effect of the administration of an antiscrobutic on this condition is apparent within forty-eight hours, resulting in the prompt formation of dentin to fill the space caused by the separation of the layer of odontoblasts.

In growing bone, the growth process ceases immediately, while the osteoblasts in certain locations, particularly beneath the periosteum, continue to proliferate. This applies to both long and flat bones. Accumulations of osteoblasts of considerable size may occur before hemorrhage takes place. That the cells under consideration are osteoblasts is proved by the effect of a single dose of an antiscorbutic substance, which is followed by the prompt appearance of bone matrix between the cells. A single administration of orange juice produces an effect that is easily demon-

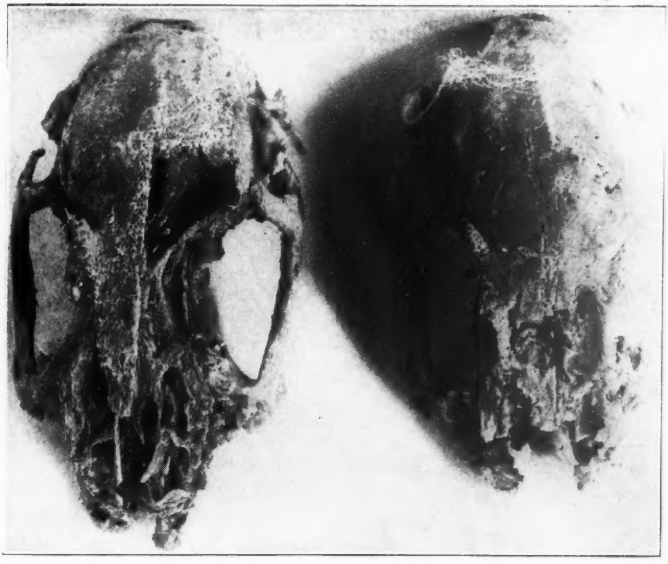

Fig. 1.—Skulls of rabbits fed on a vitamin deficiency diet.

strable forty-eight hours later. In incisions through the cortex of the bone, in the scorbutic state, there is no bony repair; while controls operated on in the scorbutic state, but given antiscorbutic substances after the operation, show new bone formation promptly.

The repair of soft tissues is likewise markedly affected. Proliferation of fibroblasts is apparently but little affected by the scorbutic state, but there

Fig. 2.—Alternate zones in the bone structure due to periods of normal and abnormal feeding.

is a marked diminution in the amount of intercellular substance formed.

Other observations were made on the effect of the scorbutic state on the bone and dentin previously formed, and also on cartilage. There is evidence that formed dentin and bone is resorbed.

The scorbutic state may be characterized as one effecting supporting tissues in which the cells are unable to produce and maintain intercellular substance. This condition affects various supporting substances to a different degree, being most marked in those in which the intercellular substance is calcified. The characterization applies to cartilage and connective tissue, and, by inference, to other intercellular substances, including that of blood vessels. The hypothesis is entertained, from the study of repair in incisor teeth of guinea-pigs, that, in the formation of intercellular substance, there is a change of the material from a liquid to a solid or jellied state, and that the missing factor, in the scorbutic condition, is one affecting the jellying or setting of a liquid product.[2]

The effect of a deficiency of the fat-soluble A factor was observed in rats. These animals were obtained from the Wistar Institute and given a diet of casein 18 gm., McCollum's No. 185 salt mixture, 4 gm., starch, 50 gm., lard, 24 gm. and Brewer's yeast, 4 gm.

Control rats were given the same diet, but with fresh butter fat instead of lard. On the deficient diet, the usual external evidences of the xerophthalmic condition developed, in from seven to sixteen weeks, according to the age of the animal. Rats that died in advanced xerophthalmia, or were killed presented few striking gross pathologic changes, in addition to the pathologic condition of the eyes, which is well known. Most conspicuous among these changes is the presence of cavities at the base of the tongue and in the pharynx, filled with a yellow cheesy material, and similar abscess-like cavities in the submaxillary glands. These gross changes are readily understood on microscopic examination. The cavities described are in reality cysts lined with a stratified keratinizing epithelium, and the cheesy content is a mixture of desquamated keratinized cells and leukocytes. A careful microscopic study of rats killed at different stages

of advanced xerophthalmia shows that the morphologic concomitants in the condition are limited practically to epithelial structures. Interesting transitional stages may be observed, and are being studied. The condition of xeropthalmia results in the transformation of various epitheliums into a stratified, squamous, keratinizing epithelium. This change is practically constant in the upper respiratory tract, including the whole of the nasal passages, larynx, trachea and bronchi. In the digestive tract, the stomach and intestines have so far exhibited no change; but all the salivary glands and accessory salivary glands are affected and frequently show cavities resulting from the retention of desquamated keratinized epithelial cells. Similar changes occur late, in the pancreas. In the genito-urinary tract, this transformation into keratinized epithelium is found in the renal pelvis, bladder, seminal vesicles, epididymis, and prostate gland. Other changes include a striking atrophy of the thyroid gland, testes and paraocular glands.[3]

In one series of twenty-two rats, the incisor teeth were studied. Microscopic changes, usually of a minor degree, were regularly found in the odontoblastic layer and frequently in the pulp. This series afforded a complete sequence, from earliest demonstrable changes to complete disappearance. Preceding complete disappearance, irregularity in the growth of the odontoblasts occur, and these produce irregular deposits of dentin. Odontoblasts, while undergoing atrophy, continue to produce dentin and, presumably owing to separation of individual cells, become incorporated in the dental matrix. Less frequent findings disclose the presence of islands of osteoid tissue, incorporating and surrounded by osteoblasts.

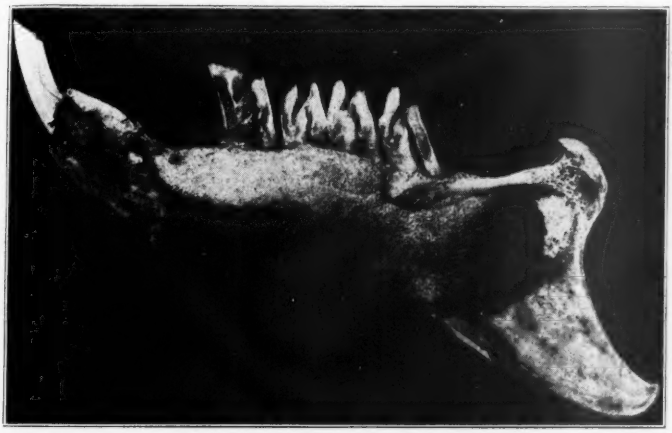

Fig. 3.—Formation of new bone on a return to a normal diet after a period of scorbutic feeding.

A careful study of the early stages of this lesion has convinced us that the connective tissue cells of the pulp take up the function and structure of osteo-

blasts, because the first step in the process is the deposit of hyaline homogeneous matrix between normal-appearing connective tissue cells. In scurvy, the first sign is the inability of the cells to produce intercellular matrices and not cell atrophy.

In the fat-soluble deficiency, enamel formation ceases, the cells being either shrunken or atrophic, or replaced by a layer of stratified, nonkeratinized epithelium.

Deprivation of the fat-soluble A factor affects specifically epithelial tissues. This effect is manifested in cells having presumably widely different chemical (secretory) functions and terminates in the complete loss of specific function and the transformation into a common type of chemically inactive (non-secretory) epithelium.

A fuller description of the changes found as a result of a deficiency of the fat-soluble A factor and of the antiscorbutic substance is in process of preparation for publication.

From what has been said, it may be seen that a deficiency of the antiscrobutic factor is followed by distinct bone and tooth changes, including resorption of formed dentin and bone. Changes in the formation of enamel and dentin have been observed as a result of deprivation of the fat-soluble A vitamin in rats, but in a less marked degree. The salivary glands are markedly affected and, as a result, the amount, and probably the character, of the oral fluids is changed.

DISCUSSION OF PAPERS OF DRS. SKILLEN, SIMONTON AND WOLBACH AND HOWE

Theodore B. Beust, Louisville, Ky.: I would like to corroborate Dr. Skillen's belief that the epithelium must of necessity be the enamel epithelium. I think in some of his preparations it was somewhat thickened by leptothrix accumulations. Whether the segregated epithelial masses shown drifted from the epithelial rests of Mallasez or are derived from the gingival epithelium, I am sure will soon become known. This is not a practical point, but certainly an interesting one. Concerning Dr. Simonton's investigation: I was particularly interested in that part which dealt with the micro-organisms. We must stress the study of bacterial action in the study of pyorrhea, and we must begin with smears. It is, of course, valuable to have as many cultural experiments as possible, but the micro-organisms peculiar to the materia alba are so far in excess of the germs that we get in cultures that the former cannot be excluded as a factor. In regard to the question as to whether the leptothrix filaments are segmented, with hematoxylin stain we almost invariably find them segmented. There were also spirochetes in evidence, together with the leptothrix. The future will certainly reveal the rôle of these organisms in pyorrhea and caries. Until the organisms that are peculiar to the mouth are cultivated, which up to date is impossible, we can form no conclusions from cultural experiments in pyorrhea. From the array of evidence presented today, I have little doubt that the etiology of pyorrhea will soon be known.

William Pilcher, Petersburg, Va.: Is the etiology of gingivitis or bleeding gums and pyorrhea that becomes almost chronic the same? Are not these three diseases, which we ordinarily treat, the same disease in different stages?

George H. Wright, Boston, Mass.: I want to bring out one point that Dr. Howe has suggested with regard to the structural changes which he has seen in the submaxillary glands in these scorbutic manifestations. It is possible for us to account for the characteristics that so frequently are manifest in another large, important gland in the mouth, the end of the tonsil. The nose and throat specialists are quite familiar with the keratosed condition of the tonsil. May it not be bound up with the same faulty metabolism, plus changes that may develop because of the toxic products associated with the various bacteria? That is merely a question,

and it may be fruitful for further discussion on another occasion.

Thomas L. Higginbotham, Louisville, Ky.: The bacteriology of pyorrhea alveolaris may well excite our interest. A question uppermost in my mind for a number of years has been as to the part that the tonsils play in infections around the teeth. Long ago, I began to be suspicious that so-called "pyorrhea of the gums," as we sometimes hear the expression, is the result of what might with equal propriety be described as "pyorrhea of the tonsils." I do not necessarily mean to convey the idea that pyorrhea is invariably the result of tonsil infection, but I am of the belief that the condition we call pyorrhea frequently is the result of bacterial invasion,which had its first habitat in the crypts of the tonsil. Improper brushing of the teeth with a stiff brush, whereby the gums are lacerated, and damage resulting from the tooth pick, are followed by what may be at first a superficial infection, resulting finally in localized areas of pyorrhea, the infection sooner or later becoming generalized. Unquestionably, a narrowing of the dental arches, with crowding of the teeth, as a result of mouth breathing caused by unremoved adenoids in childhood, through a disturbance in circulation and the lowering of vitality, hastens the ravages of such localized infection, permitting it to become generalized. It is well for us to cease to speak of the tonsil as a throat structure, including it as a mouth organ; and thus it would come within the scope of the dentist to examine carefully the tonsils of all his patients. The opportunity for the dentist to render a lasting service to his patient by calling attention to diseased tonsils is one that the physician may not have because the dentist has an opportunity to examine the mouth more frequently than does the physician. One of the members made inquiry concerning gingivitis, Vincent's infections and some other mouth conditions. Vincent's infection is not primarily a periodontal condition. It is as a rule a secondary manifestation, seen around teeth, the organism of the disease having its abode in the crypts of the tonsil. There, the germ is cultured, increases and multiplies, finally involving the mouth as a whole in the infection. I repeat that gingivitis is as a rule a secondary infection.

J. B. West, Elmira, N. Y.: We all know that pyorrhea may be caused by traumatic occlusion, as brought out by Stillman and McCall, but is it true that we must have a lowering of resistance through metabolic change before that local irritation will manifest itself in the distinctive pyorrheal lesion? I think most of us are at a loss to discuss these papers intelligently. They are papers by men who have done research work on these problems. Still, as a practical result, we want to know just where we are, and where we can link the findings with our everyday work in a practical way.

Dr. Skillen (closing): I don't know whether lowered resistance is necessary before the disease is manifested. I am not at all sure that it is. Dr. Beust remarked about the abscess sac. In this particular case, whole series of slides would have been necessary to show that the abscess sac had formed from the proliferating crevicular epithelium. There was a continuity of the epithelium all the way down. No doubt the epithelial rest does play a part. Dr. Beust remarked about the thickened tissues as possibly due to leptothrix. That appearance is due to the twisting of the thick specimen. Those were from 14 microns up. It had a keratinized appearance, simulating the keratinized layer of the epithelium on the extra-oral surface of the gingivae.

Dr. Simonton (closing): To answer the several questions serially, I might say that we have been much interested in a definite classification of pyorrhea. In our particular local problem, we are interested not alone from the standpoint of clinical dentistry, but also in order that we may discuss the disease clearly with specialists in the various biologic sciences. The broadest definition that we may formulate for pyorrhea will characterize it as any retrograde metamorphosis of the paradontal tissues. This definition will include conditions such as scurvy, Vincent's infection and mercurialism, in which the etiology is understood. These we classify under paradontoclasia A. The other types of paradontal degeneration, the etiology of which is not yet clear, we group under the

head of paradontoclasia X. This category would include the paradentitis and paradentose of Kantorowicz; the salivary calculus type; irritative types; pocket-forming types; etc. As to the second question, it is my opinion that traumatic occlusion, so-called, is merely a secondary etiologic factor. The importance of this form of mechanical irritation has been much exaggerated. It is but one of a number of local exciting agencies. The striking results that are obtained by relieving excessive occlusal stress are the obvious sequel to providing rest to a debilitated structure.

Dr. Howe (closing): I have emphasized scorbutic changes from an experimental standpoint. Since conditions that are similar to pyorrhea have so often resulted from scorbutic deficiency, I don't consider a scorbutic condition the sole cause of pyorrhea, but do regard metabolic factors in pyorrhea as the fundamental thing. The tissues that are concerned in pyorrhea are bony structures; true bone, or modified bone, and subject to changes such as occur in any bone change. Probably the nature of the alveolar process is such that it shows degenerative changes earlier than the more important parts of anatomy. Indeed one of the most interesting things that I have observed in the experimental work done is the fact that the teeth are the first parts of the body to show metabolic changes. By providing a diet not wholly deficient in the antiscorbutic vitamins, we may confine the action to the teeth. Of course, the practical part of the scorbutic condition that I have shown seems to be that, in our consideration of teeth and bone diseases, we have looked for a long time at the calcified or inorganic constituents of the tissue almost wholly. Here, we show a change in what would be the matrix of the bone. The organic part of the bone that needs to be, in my opinion, considered equally with the inorganic constituents. Bone is made up of a combination of the inorganic and the colloidal material. The latter substance is as much a part of the tooth as is the inorganic, and it is entirely possible in bone changes that a change which results in a separation of the inorganic part of the tooth from the organic part, prior to the actual localization of cavity, occurs. In regard to infection, from such experience as I have had I have come to regard it as a secondary factor. I have inoculated quite a good many animals with different bacteria, and I never have succeeded in establishing dental disease in this way although a temporary lesion around the teeth may occur. On the other hand, in many of the animals on deficient diets, all kinds of changes occur in the supporting tissues, from the slight marginal gingival redness, to complete destruction of the soft tissue, as well as of the calcified tissues. The alveolar process is left bare frequently as a result of disintegration of the soft tissues. The teeth, during certain stages in the process, drift from their normal position, and many animals are unable to close the mouth properly, because of the disturbed relation of the teeth. On the correction of diet in experin ental animals, if the process has not been kept up too long, the teeth settle back into their original position. I am inclined, from the nature of my work, to look on the metabolic factor as an important thing. To my mind, pyorrhea is not a disease but a symptom.

THE PRESENT STATUS OF THE DENTIFRICE PROBLEM*

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THE subject of the present status of the dentifrice problem is here presented after a serious review of the available literature in the journals, following a study of the publicity material of the various dentifrice manufacturers, and subsequent to interviews, both personal and by letter, with representatives of many of these concerns. The conclusions reached are based upon a correlation of material derived from these sources, and not upon any extensive personal laboratory experiments or clinical findings. The latter will be reserved for a subsequent report.

I have been confronted with a mass of scientific and pseudo-scientific material, logical and illogical conclusions based upon apparently correct, sometimes false, premises, contradictory statements of laboratory results and the clinical findings of many investigators; together with the utopian dreams and preposterous statements of the publicity department of some of the manufacturers. I find that the laboratory investigations of many able and well-known chemists and physicists, as reported in the dental journals, often result in apparently contradictory findings. It is true that some of these investigators are backed by commercial interests, with the resulting tendency to biased reports; but, in many instances, the investigations are conducted and the statements and conclusions reached are made by men absolutely independent of any commercial entanglements. Yet, so contradictory and unsatisfactory is the evidence bearing on this problem, that the seeker after truth is often mystified, and his reasoning and conclusions are likely to be clouded in doubt.

It is true that the advertising matter emanating from the manufacturing chemists has, in the main, resulted in great good, since it has focused the attention of the laity on the importance of a clean mouth; but the stress frequently laid on the function of the dentifrice as a preventive and curative agent is misleading, and undoubtedly is doing great harm. Millions of dollars are being spent annually by the manufacturers in advertisements in the magazines and in the daily papers, as well as on literature for the consumption of the dentist himself. My impression, after studying most of the available material of this nature, and after consultation with many of those responsible for it, is that the majority of the prominent commercial concerns are really sincere in what they are trying to do, although I am sure that many

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of them are poorly informed as to the physiologic and pathologic conditions with which they are attempting to deal. Some are entirely unethical, and, in some instances, even unscrupulous in their efforts, the unscrupulous being greatly in the minority.

A number of the dentifrices on the market today are unscientific, empiric, "gun-shot" prescriptions of the "cure-all" variety, and the ridiculous claims made for them, in most instances the fond dreams of the paid publicity man, are too frequently believed by an ever-gullible public and the thoughtless members of the dental profession, of whom there are far too many. Some of the commercial firms fostering the latter type of preparation refuse to give any information whatever about the dentifrice which they advertise. Their formula is secret and not available to the public or to the dental profession. Notable among these could be mentioned a firm in New York and another in Detroit, both of whom refused, on request, to reveal formulas or constituents, although they were told that the information was desired for the benefit of the dental profession and of humanity.

"Doctor, what dentifrice shall I use?" When we, as scientific practitioners of the healing art, can intelligently answer this question, the dentifrice problem will be solved. I am convinced that, in the great majority of instances, the answer of the dentist to this question is either an evasive one, or is based upon a cursory reading of the latest literature describing some new product, which *may* be harmless, or may be capable of producing great injury.

A number of years ago, the American Medical Association sponsored and conducted a campaign, through the columns of a prominent weekly periodical, exposing fraudulent patent and secret nostrums. There is great need for a similar procedure on the part of the American Dental Association. A movement of this nature would receive the hearty endorsement of the reputable and ethical manufacturers of dental preparations, as well as that of the profession and the public at large. The appointment of a joint commission of suitable representatives from the American Dental Association and the American Pharmaceutical Association, whose duties would be to study all aspects of this question, confer with the manufacturers, recommend various formulas suitable for use under varying conditions, and to approve or reject all products manufactured, would result in great good.

BRIEF STUDY OF THE MOUTH AND ORAL FLUIDS

Before we can intelligently discuss the question of dentifrices, it is necessary to review briefly the important characteristics of the tissues on which the dentifrice is intended to act; viz., the teeth and soft tissues, and the fluid in which these tissues are bathed.

The tooth is normally covered by the enamel, which has a comparative hardness of from 5.5 to 5.7, and which is permeated by numerous branching tubes containing living matter. In cases of receding gum, abrasion, erosion and caries, the normal enamel protective covering is lost, and either the dentin or cementum is exposed, both of which are penetrated by canals containing living matter and which have a comparative hardness of from 3.5 to 5. All of the tissues of the tooth act as dialyzing membranes, and are permeable to stains,

calcium ions, fluids and other substances. Pickerill has succeeded in passing graphite through the enamel; while Bunting, Price, Pickerill and others have dialyzed calcium salts through it and increased its weight by this process. All of the tissues of the tooth are stainable by silver nitrate, analin dyes and colored dentifrices. The tooth, when first erupted, is comparatively soft and readily permeable, but increases with age in hardness and solidity, through the deposition of calcium salts.

The gums cover the alveolar process and are attached to the teeth at the gingival line, rising from here in a thin knifelike edge, which is delicately constructed and subject to injury through mechanical and chemical irritation and trauma. Nature intended the gums to be subjected to stresses derived from the mastication of coarse, fibrous foods, which has a stimulating and hardening effect on them. Imperfect mastication of soft foods results in loss of tone and lowered circulation and resistance in these tissues.

The teeth and soft tissues of the mouth are bathed in the salivary fluids, consisting of the saliva from the salivary glands and mucus from the mucous glands. Mixed saliva is about 995 parts water and 5 parts solids, the solids consisting of mucin, potassium sulphocyanate, ptyalin, sodium and potassium chlorids, calcium, magnesium and sodium phosphates, and calcium bicarbonate.

The mixed saliva is amphoteric, having both an alkaline and an acid reserve. Normal resting saliva has a hydrogen ion concentration of about 6.6 as an average, this varying in individuals, at different times of the day, and under various stimuli. Saliva, as it flows from the salivary glands, has an alkaline reserve predominating. In resting saliva, acidity predominates, owing to the presence of carbon dioxid from the lungs.

Ptyalin, the amylolytic ferment, transforms starch into maltose and dextrose and acts best in an alkaline medium. The mucin is present in the saliva as alkaline potassium mucinate, and acts as a lubricant for the food and teeth, just as oil does to a motor. When it comes in contact with the acids of fermentation, it combines with them, thus helping to neutralize them, forming acid mucin, which is deposited on the teeth in the form of a film. Mucin deposits at p_H 4.58 and is redissolved at p_H 5.23.

The recognized functions of the saliva are: to act as a flushing agent in the mouth; to assist in the digestion of starch particles on the teeth, through its amylolytic ferment, ptyalin; to lubricate the food and afford a protecting film against the acids of fermentation, through its mucin content, and to moisten the bolus of food, so that it may be more readily masticated and swallowed. Also, it keeps the soft tissues of the mouth in a proper state of moisture for the performance of their functions and affords necessary moisture for the teeth, to prevent their drying out and becoming too brittle. The work of Michaels, Marshall, Bunting, Pickerill and Ruthrauff would indicate that it also has, undoubtedly, very important and hitherto unrecognized functions in the calcification and hardening of the teeth after eruption, through its calcium and phosphate content.

TYPES OF ORAL CONDITIONS

There are three general types of oral conditions with which the dentist comes in contact: 1. The type in which

there is a partial or complete immunity to caries, the teeth being of good structure; and almost complete absence of calculus deposits, with the soft tissues firm and healthy. 2. The type in which caries is predominant, the teeth of poor structure and calculus comparatively absent, with little evidence of periodontoclasia (pyorrhea alveolaris). 3. The type in which the tendency to calculus is marked, the teeth being of good structure, with predispositions to active periodontoclasia. The first type is, of course, the rarest; the second is possibly the most frequent, being found in adolescence and early adult life; while the third is more often found in the middle and later periods of life. The factors concerned in the production of these three types are undoubtedly intimately related to the calcium metabolism of the body, affecting the structure of the teeth and soft tissues and the composition of the saliva, and the objective manifestations are entirely different. Is it rational, then, to prescribe a single dentifrice for all three types? Yet this is what is being done in the publicity material of many of the dentifrice manufacturers and by many men in the practice of dentistry.

CLASSIFICATION OF DENTIFRICES

Dentifrices, as at present manufactured, may be given a general classification into alkaline, neutral and acid; saponaceous (soapy) and nonsaponaceous; proteolytic (protein digestive) and nonproteolytic; amylolytic (starch digesting) and nonamylolytic.

The principle cleansing agents in the alkaline preparations consist of one or more of the following substances: talc, with a comparative hardness of 1; magnesium oxid with a hardness of 2; magnesium carbonate, hardness 2.5; calcium carbonate, hardness from 3 to 3.5; pumice, hardness 6. The principal cleansing agent in the two most prominent acid pastes is tricalcium phosphate, with a hardness of from 4 to 5. The hardness of enamel ranges from 5.5 to 7, of cementum and dentin, from 3.5 to 5. It would seem, then, that tricalcium phosphate as a base is too harsh to be brought in daily contact with exposed cemental and dentin surfaces, or even the enamel of soft, deciduous, or malacotic teeth. Pumice and cuttle-fish bone are constituents of some of the other preparations, the former for use in pyorrhetic and smokers' mouths. An examination of a large majority of the most prominent powders and pastes will reveal the fact that excessive grittiness is gradually being eliminated. Other constituents frequently found in the alkaline preparations are soap, glycerin, or glycerite of starch (pastes), sugar or glucose, alcohol, saccharin, essential oils, thymol, menthol, benzoic acid, boric acid and sodium perborate. A recently introduced acid paste is largely a solution of tricalcium phosphate in acetic acid. The original acid paste consists principally of calcium phosphates, sulphates and chlorids, calcium tartrate, glycerin, benzoic acid, water, pepsin and flavoring.

The chief function of a dentifrice is to cleanse the tissues of the mouth and assist in maintaining these tissues in a normal condition without producing injury. Its formula should be as simple, and contain as few ingredients as possible. It should not be highly medicated with antiseptics, astringents and strongly stimulating substances. The function of a dentifrice is not to medi-

cate. There is no particular need for soap. The chief advantages claimed for it are its detergent properties; its power to depress the surface tension of liquids and thus to diminish the activity of bacterial life, and its power to penetrate the fatty coats of bacteria. Since it is claimed that it hydrolyzes in the saliva and forms caustic soda and free fatty acids, that it increases the adhesion of the film, reduces the salivary flow and increases the tendency to tartar deposition, its efficacy is of doubtful value. Recently, certain manufacturers are advertising the incorporation of ferments or digestives in their preparations. One of these contains 0.621 per cent of pepsin, a proteolytic ferment. U. G. Rickert has found that it requires thirty-eight minutes to digest twenty-four hour plaques with this ferment; hence, its value of practically nil. The efficacy of an extensively advertised tooth powder is supposedly greatly increased through the incorporation of caroid, a ferment derived from *Carica papaya* and other tropical plants, and an Ohio concern is creating quite an impression on the minds of the credulous through demonstrations of the starch-digesting properties of its preparation, which contains diastase, a ferment derived from germinating barley and other grains. Since the chief function of dentifrices is to cleanse the mouth, the inclusion of substances of this nature, although probably good advertising, is unphysiologic and of doubtful advantage. Some of these dentifrices are claimed to increase the ptyalin content of the salivary fluids through the action of certain constituents. If they do, which has not been proved, there is no particular advantage in this action, Pickerill to the contrary, since the function of ptyalin is to transform starch into sugar, which is only one step further in the manufacture of lactic acid in the presence of fermentative bacteria.

The manufacturers of a prominent alkaline paste of marked saponaceous content are still laying stress on the phenol coefficient (0.15) of this preparation, as capable of destroying from 80 to 90 per cent of the flora of the mouth and greatly reducing the action of those remaining. Since the air is teeming with micro-organisms, as are many substances entering the mouth, it is manifestly impossible to maintain the oral cavity in a sterile condition, even if this were desirable. In addition to this, the partial reduction of the mouth flora is only temporary, and necessarily accomplished through the action of drugs which must undoubtedly ultimately produce pathologic effects on the soft tissues. Also, some of the mouth flora have important functions to perform, this function being interfered with when they are destroyed. An extensively advertised paste, dispensed in two different strengths, is supposed to be highly efficacious on account of its iodin content. Number 2 is supposed to be an especially efficient bleacher, to be used by smokers and those who do not give their mouths regular attention. An analysis of these two pastes did not show any free iodin and revealed only a small percentage of iodid. As far as could be discovered, the only difference in the formulas was greater abrasive power and the inclusion of 1 per cent more soap in Number 2.

It is pleasing to note that artificial coloring matter has been gradually disappearing from dentifrices since I called attention to their staining effects

on the tooth at the meeting of the National Dental Association in Cleveland, in 1911, a short time before the United States Pure Food Bureau took legal steps to prohibit the inclusion of similar substances in foodstuffs. The manufacturers of some of these preparations still are artificially coloring them, supposedly either to improve their appearance and increase their sale, or for the psychologic effect on the user. Although the emetin error was long ago exposed, some of these preparations still include emetin or ipecac in their formulas. Potassium chlorate is contraindicated for continued use in the mouth, on account of its depressing and softening effect on the gums; yet, a well-known tooth paste still contains a high percentage of this drug. The inclusion of many of the latter remedies mentioned, in a preparation for use in the mouth several times a day, may give rise to dangerous and unexpected complications, if swallowed by children. Sodium chlorid is being included in some of the formulas. It is at least harmless in the strengths being used, but would probably be more efficacious if used alone. It is only very mildly germicidal and a stimulant to the local capillary circulation. It reduces congestion by exosmosis. It helps to keep mucin in solution and increases the action of ptyalin. Its use in the meat-curing industry and its use in the form of brine for hardening the hands of pugilists is supposed to make it highly efficacious as a constituent of a recently introduced dental cream, whose name would indicate that it has high bleaching power, which it has not.

The use of glycerin in practically all dental creams seems to be a necessity, since no substitute has yet been found for it. This substance is a tri-atomic alcohol, a powerful dehydrant and depletent. It is the most important constituent of cataplasma kaolini (antiphlogistin), used to dehydrate and deplete inflamed tissues, and is extensively used in rectal and vaginal suppositories. For these purposes, it is undoubtedly efficacious; but as a constituent of tooth pastes for continuous use, especially in healthy mouths and in mouths receiving the careful attention advised by modern periodontists, it is, if used in high concentration, capable of producing great injury to the soft tissues. Dental creams, owing to their convenient form, are, and undoubtedly will continue to be, used by the majority in preference to powders. They are probably producing little injury in poorly cared for mouths, but will continue to be objectionable for the opposite types until some efficient and harmless substitute for glycerin is found. For this reason alone, the powder, regardless of its inconvenience in handling, is less dangerous, if its formula does not contain more harmful constituents than glycerin.

ALKALINE VERSUS ACID DENTIFRICES

Formerly, the principal functions attributed to dentifrices were the mechanical cleansing of the teeth, reduction in the number and toxicity of the micro-organisms and the neutralizing of the acids of decay. In recent years, these ideas have been modified, and through the work of Pickerill, Gies and others, it is believed, by many, that the important factors to be dealt with are the stimulation of the flow and the alkalinity of the saliva; the dissolving of the mucin film, and the increase of the ptyalin content. Let us briefly consider these factors, and discuss the avail-

able evidence, as reported by various investigators.

Ptyalin.—Pickerill claims that eating acid fruits and the use of fruit acids increase the ptyalin content of saliva more than ten times. Other well-known writers claim that no dentifrice investigated by them increased or decreased ptyalin in saliva, except slightly, and then but for a short time. The ptyalin content varies in individuals and at different times of the day. It acts best in an alkaline medium, and acids destroy it. Sodium chlorid increases its action; while astringents reduce its activity. The action of ptyalin on hydrolyzed starches is to transform them into maltose and dextrose. Since maltose and dextrose are readily fermentable, through the action of bacteria, into lactic acid, it would seem that, if the findings of Pickerill are correct, the use of fruit acids for this purpose increases the danger of caries production, and attempts to increase its activity are manifestly illogical.

Increasing the Flow and Alkalinity.—The reaction of the saliva as it flows from the salivary glands is slightly alkaline. This reaction is not modified by stimuli, either acid or alkaline. When there is an increased flow of saliva from these glands, it immediately becomes mixed with the resting saliva and, of course, increases its alkalinity. Salivary flow is increased by mastication, brushing the teeth with or without a dentifrice, psychic phenomena paraffin chewing (most effective), and the presence of essential oils, odors of food, pleasant flavors, fruit acids, inorganic acids, alkalis and most foods. The resultant increase in flow will obviously increase temporarily the alkalinity of the mixed saliva, which is normally acid, on account of its carbonic acid content, holding in solution monocalcium phosphate, which is also acid. This is a provision of Nature to help maintain normal equilibrium. The salivary flow and alkalinity vary in individuals, and at all hours of the day. It is increased during digestion, and falls during the interim. Stimuli have been found to produce opposite effects in different individuals. Practically all dentifrices increase the flow and alkalinity of saliva for a short while. Both acid and alkaline dentifrices reduce the acidity for a period, in some individuals the acid being more effective, in others, the alkaline. Brushing without a dentifrice increases the flow and alkalinity of the mixed saliva about as much as with the use of the dentifrice. In all instances, the flow and reaction returns to the normal in a short time.

This is the evidence as far as the action of stimuli is concerned. There is no particular advantage to be derived from attempting to increase the flow and alkalinity of the oral fluids by artificial stimuli, except probably in special cases of diminished flow and volume, with consequent increased tendency to caries. Undoubtedly, in average cases, repeated stimulation of the salivary glands would ultimately result in depression and salivary impoverishment.

Michaels has demonstrated that, in all cases of immunity to caries, the resting saliva is hyperacid; while in susceptibility, it is hypoacid. Marshall has corroborated his findings, stating that, in caries, there is high alkalinity and low acidity, and that in immunity, the conditions are reversed. Marshall has promulgated his salivary factor, which will be discussed later. These findings,

which are accepted by the majority of investigators in the dental profession, indicate that the chemical reaction of mixed saliva is not concerned in or particularly influenced by the fermentation of carbohydrate débris on the teeth, but rather that caries is produced by spot acidity under the film or bacterial plaque, which does not come in contact to a great extent with the oral fluids, owing to the interposition of the film. The relationship of Michael's findings and Marshall's salivary factor will be discussed later. They are mentioned here to show that spot acidity is the exciting cause of caries, and not general acidity of the salivary fluids. Consequently, attempts to increase or maintain, for long periods, the alkalinity of the mixed saliva, are not only ineffectual as far as neutralizing spot acidity is concerned, certainly until the film is removed, but also may actually do harm by increasing susceptibility to caries by reducing the acid reserve found by Michaels and Marshall to be coincident with immunity. This acid reserve of the resting saliva is largely due to the presence of monocalcium phosphate (acid calcium phosphate), which is held in solution by the carbon dioxid acidity. When carbon dioxid acidity is reduced, there is an increased tendency to the formation of alkaline tribasic calcium phosphate, which, being insoluble, is deposited on the tooth surface as calculus, and may possibly, under certain circumstances, be dialyzed into the enamel.

Removing the Mucin Film.—Mucin is in solution in the saliva as alkaline potassium mucinate. The presence of the sodium chlorid constituents of saliva assists in holding it in solution. When contact is made with the acids of fermentation, it is precipitated as acid mucin, in the form of a protecting film on the tooth surface, thus helping to neutralize the local acidity. If fermentation is excessive, this protective action is soon lost through the production of more acid, which deposits under the film. In addition, micro-organisms, food débris, and calcium salts become entangled in it; hence, the advisability of its occasional removal in order that fresh film may form, just as oil should be occasionally changed in a motor. Potassium mucinate may be precipitated by acids at p_H 4.58, but the acid mucin film on the teeth, having already been acted on by acids, cannot be further precipitated or dissolved by organic acids. It is soluble in strong mineral acids of weak concentration. However, it is claimed that weak organic acids do have a curdling effect, which may assist in loosening the attachment of the film and facilitate its removal by the brush. The work of Jaques Loeb, Martin Fisher and Vogt has demonstrated that the quantity of protein dissolved, and the rate of its dissolving, increase with the degree of alkalinity (within certain limits) of the reagent used.

In the mouth, mucin film is readily removed by harmless abrasives; is curdled by weak organic acids so that it may be more easily detached, or is dissolved by dilute alkalies or salts of alkali metals, the latter transforming it into alkaline mucinate. It would seem, then, that the most efficient agent for the removal of film would be the action of the brush assisted by a weak alkali salt; that acids are not especially effective for this purpose; and that, as previously stated, digestive ferments are ineffective.

CALCIFICATION OF THE TEETH BY DENTIFRICES

A recently introduced dentifrice in the form of a paste, composed largely of tricalcium phosphate in solution in acetic acid, is claimed to have a solidifying or calcifying effect on the teeth. Its sponsor claims that, through its action, tricalcium phosphate, which is the chief inorganic constituent of enamel, is dialyzed into the tooth structure and deposited there, this increasing its hardness and reducing its permeability, with the result that the resistive power of the tooth is increased and partial or complete immunity to caries is produced. The theory of its chemical action is based upon a correlation by its inventor of the research work of Michaels, Rickert, Joseph Head, Pickerill, Bunting, Marshall, Price, Howe and others, on the calcium metabolism of the blood, saliva and the body as a whole. It is well to review briefly the essential features of the work of these investigators in order that an understanding may be reached with reference to this preparation and, also that some definite conclusions on the subject of this paper may be reached.

The following findings have been established by experiments *in vitro* or *in vivo* with reference to calcium metabolism.

The saliva has a high acid reserve in immunity and a high alkaline reserve in caries. (Michaels.)

Marshall corroborated Michaels in his findings and established his "salivary factor:" when the total alkaline and acid neutralizing power of resting saliva does not exceed by 80 per cent the total alkaline and acid neutralizing power of activated saliva, the teeth are immune; while there is active caries in mouths in which the percentage exceeds 80.

The enamel increases in hardness with age. (Boedecker, Morgenstern and Boedecker.)

Enamel slightly decalcified by acids can be hardened by the action of saliva, either by a recrystalization or by reuniting with some constituent of the saliva. (Joseph Head.)

Enamel hardens with age. It is permeable to stains and fluids, its permeability decreasing with age. Both the enamel and dentin act as dialyzing membranes. Crystalloids pass through, while colloids do not. Calcium phosphate is held in solution in the saliva by carbon dioxid, which, not being given off early, the calcium phosphate is dialyzed into the enamel and deposited, the carbon dioxid passing back into the saliva. (Pickerill.)

Bunting found that, in hard dense teeth immune to caries, there is a salivary calcium content of from 0.0030 to 0.0040 gm. to 25 c.c. of saliva; in soft teeth with susceptibility to caries, the salivary calcium content was reduced to 0.0025 gm. to 25 c.c. as a maximum; while in pregnant women, the calcium content was found to vary from 0.0017 to 0.0021 gm. to 25 c.c. of saliva. He also succeeded in calcifying *in vitro* porous specimens of enamel immersed in the saliva of the immune individuals showing high calcium content. He then immersed teeth in a solution of saliva to which was added acid calcium phosphate and tricalcium phosphate and obtained less penetration by silver nitrate on these teeth, showing partial calcification. (Bunting.)

The enamel is not complete when first formed, but hardens with age, and

the tooth is a permeable membrane. Calcium salts were passed through both enamel and dentin by osmosis, and when the calcium salt concentration in saliva is high, there is increased permeation of calcium into enamel. Furthermore, owing to changes or fluctuations in composition of blood and saliva, there is an increased deposit of calcium salts from the circulation of the pulp into the tooth substance, as well as a similar deposition from the saliva inward. (Bunting and Rickert.)

Calcium ions may be readily dialyzed through the enamel and an increase in weight is noted following this phenomenon. (Price.)

Albumin, globulin and other colloids pass from the blood through the salivary glands into the saliva. Both blood and saliva contain carbonates and phosphates greatly in excess of their solubility in water; and carbon dioxid is an important factor in maintaining these substances in solution in fluids undergoing calcification. (Howe.)

The findings as to permeability of the hard tissues of the tooth were corroborated. (C. F. Boedecker.)

The possibility of producing increased calcification of tooth enamel in the mouth through the action of a dentifrice will have to be based upon a correlation of these findings. After a serious study of this question, I am convinced that it is possible to produce a certain deposition of calcium salt into porous enamel via the enamel tubes. Owing to the fact that the attacking agencies concerned in caries production are acting at all times and that an artificial calcifying agent is acting for only a short period, the constructive force of the latter is not by any means sufficient to overcome the destructive agencies in the mouth. The work of McClellan, Mellanby, Howe, Gies, Price and others would indicate that the building of healthy bone and tooth structure, as well as the development and maintenance of the health of the other tissues of the body, are to be accomplished principally through dietary and general health measures, and not through putting into the body fluids pharmaceutical preparations of calcium, iron or other salts.

CONCLUSIONS

1. The publicity material of the dentifrice manufacturers is producing an increased interest on the part of the public in oral hygiene, but is also resulting, in many instances, in a misconception as to the functions of the dentifrice and its limitations as an agent in the treatment of oral pathologic conditions.

2. A dentifrice should be of simple formula, constructed with the principal idea of assisting the brush and dental floss in properly cleansing the hard and soft tissues of the mouth without injury.

3. Owing to variations in the conditions in different mouths, it is impossible to so construct a dentifrice that it will be suitable to the needs of all individuals. A dentifrice that may be harmless to one may be entirely unsuited for use in the mouth of another.

4. The inclusion of proteolytic and amylolytic ferments in these preparations is unphysiologic and of doubtful utility.

5. Grittiness and color have been largely eliminated from modern dentifrices, although there are still some which are harmful in these respects and which should be avoided.

6. The incorporation of strong

antiseptics, astringents and other highly medicated substances is not only useless, but also may do great harm, especially in healthy mouths, and to children. The chief function of a dentifrice is not to medicate, but to cleanse harmlessly.

7. The chemical reaction of these preparations is not important, since most of them increase the flow and alkalinity and assist in the removal of film. None of them increase the ptyalin content of the saliva as it flows from the salivary glands. Attempts to increase ptyalin content of mixed saliva are of doubtful value.

8. Efforts directed toward the efficient building and maintenance of the hard and soft tissues of the oral cavity should include the following procedures: (a) the usual hygienic measures recommended by the medical profession for the maintenance of health standards, including sunlight, exercise, baths and diet; (b) inclusion in the dietary of acid fruits, green vegetables, whole wheat bread, milk and the other substances that naturally furnish the necessary vitamins, calcium and phosphorus for the proper metabolism of the body; (c) the daily consumption of articles of food of a coarse, fibrous nature, requiring heavy mastication, which will assist in cleansing the teeth and stimulating the gums, and giving the necessary roughage in the intestinal tract to stimulate peristalsis; (d) practice of the proper methods for cleansing and maintaining the hard and soft tissues of the mouth in a healthy condition, including the proper use of the brush, dental floss and tongue scraper, and the use of a harmless and secondary adjunct in the form of a nongritty, colorless and not highly medicated dentifrice.

DISCUSSION

J. S. Ashbrook, Pittsburgh, Pa.: As to the matter of claims made in advertisements, someone has said it has become a national habit of accepting advertisements as a guide in life. The public are rather "fickle," which accounts for the phenomenal success in this field. In dental health activities a splendid opportunity is given and we must acknowledge some good is derived from advice given under this head by many of the manufacturers of dental preparations. Such publicity should be under the direction of our association. From a reliable source, we are informed that the manufacturers of the two most harmful preparations mentioned by Dr. McGehee expended more than $3,000,000 last year in their misleading publicity. What is the answer? Secret formulas should not be endorsed. Dental journals should not carry such advertisements. It has been found on a brief survey that the majority of dentists are indifferent to a marked degree on this subject, recommending the best flavored preparation in nearly every case, with the thought in mind, "if it does no good it will do no harm." Even so, our duty is to protect and guide the public. We should standardize and insist on alkaline preparations, prescribing medicated powders or solutions only when indicated. Diet is the most important factor, especially in early life. Large families of little means had better use dentifrice and candy money for milk, and let the brush keep the teeth clean. I would recommend that dental schools assign to their senior students, under the department of dental medicine and pharmacology, a three months' laboratory course requiring compounding of these very necessary preparations for the mouth and teeth. In the Pittsburgh school, we find, after several years, presentation of a course of this kind has resulted very favorably. Let us keep this issue alive and insist on our rights; for, after all, the proper dentifrice and brush may aid in overcoming this grave malady of civilization—dental caries.

M. D. Huff, Atlanta, Ga.: The sincerity of some of the manufacturers of dentifrices has been questioned by Dr. McGehee, and justly so. For example, a popular one of these advertises that bacteria-laden saliva was treated by passing air through their product and then through the said saliva in test tubes and the bacterial count reduced to one two-

hundredth. In one advertisement, it was admitted that six hours was required for the result. In subsequent advertising "six hours" was omitted, since it was evident, even to the "ad" writer, that the time element was, to say the least, impracticable. Imagine the futility of this when it has been shown that by merely cleansing the teeth, the bacterial count has been reduced one eight-hundredth. Again, there is something wrong when the teeth of our patients become sensitive at the gingival area in direct proportion to the persistence with which they follow instruction as to how and how often their teeth should be brushed with certain dentifrices. This problem is so important that, at the meeting of the American Academy of Periodontology held here last week, a committee was appointed and money appropriated for the purpose of investigating the relative worth of present proprietary and patent dentifrices. You may be interested to know also that the Research Commission of the American Dental Association has appointed a committee, with Dr. Homer C. Brown as chairman, with the same object in view; so that we may hope to arrive at the truth by having unbiased minds to attack the situation scientifically. The honest manufacturers, who are in the majority I believe, will welcome this investigation, while the others will resist with all their power, hoping to continue to reap a rich harvest from the gullible public, and with the assistance of an almost equally gullible profession at the present time. Dr. McGehee mentions the "cure all" variety of dentifrices and their ridiculous claims and brings out a well taken point, for dentifrices are not capable of curing anything and such claims should not be allowed. The folly of employing antiseptics for more than temporary effect, and that very slight, is evident. The only excuse for them is the fact that they may make a preparation more palatable, and without this quality, little would be used, especially by children. This fact is important, because it is at this stage in life that the dentifrice habit should be formed if one that is not harmful is supplied. Strong drugs, such as chlorate of potassium, are absolutely contraindicated in the mouth of the average individual when used as a dentifrice on account of its irritating and, in the case of children, possible poisonous effects. Imagine the absurdity of placing iodin in a dentifrice for use regularly three times a day for life, and yet some new dentifrices recently claimed an iodin content. It is just as illogical and unscientific to employ dentifrices for their therapeutic value in normal conditions of the oral cavity in youthful or healthy patients as it would be for a physician to give medicines continually to an individual in perfect health in order to keep him well instead of advising exercise, proper diet and correct living to accomplish the same end. Dr. McGehee is correct in his contention that dentifrices cannot be expected to digest food bacteria and change the acidity or alkalinity of the salivary fluid, or increase the supply; for Nature is the best possible agent to do those things, and if Nature fails, scientific systemic treatment is necessary. Let us urge the sensible use of dentifrices as an adjunct to the brush, the floss and other prophylactic means, choosing, as Dr. McGehee advocates, nongritty, colorless and not highly medicated dentifrices. As a member of the committee from the Research Commission, I promise an honest effort in solving this problem.

Warren Martin Clawson, Cincinnati, Ohio: I would like to ask Dr. McGehee to say a word about magnesia, or milk of magnesia.

A. J. Steele, Louisville, Ky.: Dr. McGehee refers to the "gullible" public as well as the "gullible" dentist. What has the dentist to depend on? He can't go into a definite research in his laboratory and find out which is the best paste, yet one of the most important questions that is ever asked him in his office is: "What dental paste shall I use?" It is the duty of the American Dental Association to tell us, after careful research work, what pastes are the best for us to use and to recommend to our patients.

M. D. Huff, Atlanta, Ga.: The gullible dentist is the one that buys stock in a company and advertises it to his patient and tells him to use it because he can make money out of it.

Dr. McGehee (closing): The recommendation of Dr. Ashbrook is very pertinent. The average student, when he gets out of dental college, knows nothing about dentifrices. He should be taught their ingredients and effects. The appointment of a committee by the American Dental Association for investigation of this problem is an advance and an important one. Magnesia was mentioned. As far as I know, it is harmless, in weak strengths. In regard to the sincerity of the

manufacturers, there may be some representatives of the manufacturers in the room. I have tried to deal fairly with the manufacturers in my paper, and, as I said, I feel confident, after coming in personal contact with many of their representatives and after correspondence with them, that the majority of these men are sincere in what they are trying to do. Of course, they regard the matter from a business standpoint. At the same time they are firms of integrity. Others are of the opposite type. And I fear that even the manufacturers who are sincere do not, many of them, realize the significance of the physiologic and pathologic conditions in the mouth with which they are trying to deal.

BIBLIOGRAPHY

Proteins and the Theory of Colloidal Behavior, 2, Jaques Loeb.

Oedema and Nephritis, Martin Fisher.

Dentifrices, Martin Hill Ittner, Northwest J. Dent., May, 1923, Vol. 11.

The Acid Dentifrice as an Intelligence Test, Paul R. Stillman, John Oppie McCall, Dent. Items Int., April, 1923.

Soap in Dentifrices, John R. McClellan, American Perfumer, May, 1923.

Prevention of Dental Caries and Oral Sepsis, H. P. Pickerill.

Dentifrices and the Saliva, John R. McClelland, Dent. Cosmos, April, 1924; July, 1924.

Attenuation of Bacteria Due to Temperature Shock, P. W. Allen, J. Bacteriol., 1923, Vol. 8, p. 555.

A Dental Contribution to Dental Medicine, N. S. Jenkins, Dent. Rev., 1908, Vol. 22, p. 917.

Sepsis of the Tooth Brush, W. P. Harrison, Brit. Dent. J., Vol. 34, p. 651.

Influence of Various Stimuli on Human Saliva, J. B. McClellan, Am. J. Physiol., December, 1922, Vol. 63, No. 1.

Review of Present Status of Dental Practice, Thomas Cowling, Dominion Dent. J., 1924, Vol. 36, p. 296.

Tissue Structure and Dental Practice, Newton D. Thomas, Dent. Cosmos, 1924, Vol. 46, p. 1201.

Dentifrices and the Saliva, John B. McClelland, Dent. Cosmos, April, 1924, p. 425.

Dentifrices and the Saliva, John B. McClelland, Dent. Cosmos, July, 1924, p. 751.

Volumetric Analysis, Sutton, Ed. 10.

Diagnostic Methods, Webster, Ed. 5, p. 395.

Operative Dentistry, G. V. Black, Vol. 1, p. 134.

Science and Practice of Dental Surgery, Bennet, p. 248.

Microscopic and General Anatomy of the Teeth, J. Howard Mummery, 1924 edition.

Sialo-Semiology, Joseph P. Michaels, Proc. Third Internat. Dent. Cong.

C. F. W. Bödecker, Dent. Cosmos, 1918, Vol. 44, p. 654.

Sialo-Semiology, Joseph P. Michaels, Dent. Cosmos, December, 1900, Vol. 13, p. 1295.

Douglas E. Caush, Dent. Cosmos, February, 1905, p. 165.

Modern Dentistry, Joseph P. Head.

C. Francis Bödecker, Dent. Cosmos, September, 1911, pp. 1002, 1003.

Proc. Panama Pac. Dent. Cong., John Albert Marshall, 1915, pp. 213, 220, 342.

Dental Caries, R. W. Bunting and U. G. Rickert, J.N.D.A., August, 1915, p. 252.

Report of Work on Dental Caries, R. W. Bunting and Florence H. Wixon, J.N.D.A., January, 1917.

Composition of Saliva in Relation to Incidence of Dental Caries, John Albert Marshall, J.N.D.A., July, 1917, pp. 776-778.

Percy R. Howe, J. Allied Dent. Soc., December, 1914, p. 590.

Studies of Saliva and Teeth, William J. Gies, J.N.D.A., September, 1914, pp. 401-407.

The Tooth, a Permeable Membrane, R. W. Bunting and U. G. Rickert, J.N.D.A., May, 1918, pp. 519-526.

Charles F. Bödecker, J.N.D.A., January, 1913, p. 61.

William J. Gies, J. Allied Dent. Soc., March, 1916, pp. 47-94.

Percy R. Howe, J. Dent. Res., March, 1921, pp. 7-38.

Percy R. Howe, J. Allied Dent. Soc., December, 1914, p. 592.

Further Study of Acid Media, William J. Gies, J. Allied Dent. Soc., December, 1914, p. 554.

Permeability of the Enamel in Relation to Stains, C. F. Bödecker, J.A.D.A., January, 1923, p. 60.

Landmarks in Dental Research, Monograph, W. M. Ruthrauff.

Secreting Tubes in Human Enamel, Monograph, W. M. Ruthrauff.

Organic Structure of Enamel Rods, Monograph, W. M. Ruthrauff.

An Experimental Study of the Tooth Staining Properties of Various Colored Dentifrices W. H. O. McGehee, Dent. Cosmos, March, 1912.

Staining of Teeth by Colored Dentifrices, W. H. O. McGehee, Arch. f. Zahnheilk., July, 1912.

Relation of Saliva to Dental Caries, W. H. O. McGehee, New Jersey Dent. J., July, 1916, p. 257.

Prevention of Dental Caries, W. H. O. McGehee, Dent. Summary, August, 1918, Vol. 38, p. 597.

Prevention of Dental Caries, W. H. O. McGehee, Dent. Summary, Vol. 36, p. 1019.

Causes and Prevention of Dental Caries, W. H. O. McGehee, Dent. Summary, Vol. 37, p. 635.

Chemistry of the Dentifrice Problem, Carl Pfanstiehl, J.A.D.A., April, 1923, Vol. 10, p. 301.

Rôle of Bacillus Acidophilus in Dental Caries, R. W. Bunting and Faith Palmerlee, J.A.D.A., April, 1925, Vol. 12, p. 381.

Evidences of Structural Changes of Enamel, U. G. Rickert, J.A.D.A., May, 1924, Vol. 11, p. 391.

Changes in Structure of Enamel After Tooth Eruption, Theodore B. Beust, J.A.D.A., May, 1924, Vol. 11, p. 397.

Permeability of Enamel in Relation to Stain, William G. Skillen, J.A.D.A., May, 1924, Vol. 11, p. 402.

Dental Caries in the Light of Present Day Knowledge of Dental Nutrition, Wallace Seccombe, J.A.D.A., April, 1924, Vol. 11, p. 360.

Diet and Its Relation to Dental Caries, R. W. Bunting, J.A.D.A., January, 1924, Vol. 11, p. 64.

Problem of Wetting and Its Importance In Bacteriology, W. P. Larson, J.A.D.A., April, 1924, Vol. 11, p. 327.

Further Studies of the Etiology of Dental Caries, T. B. Hartzell and W. P. Larson, J.A.D.A., July, 1925, Vol. 12, p. 784.

Diet as Related to Prevention of Mouth Disease, Percy R. Howe, J.A.D.A., August, 1923, Vol. 10, p. 755.

Cause and Prevention of Dental Caries, Leonidas I. Luton, Dent. Summary, August, 1923, p. 644.

Some Experimental Effects of Deficient Diets, Percy R. Howe, Dent. Summary, March, 1924, p. 212.

Application of Principles of Physiology to Preventive Dentistry, H. W. MacMillan, Dent. Summary, April, 1924, p. 314.

Status of Sodium Chlorid, Andrew T. Buckley, J.A.D.A., October, 1924, Vol. 11, p. 1014.

Rules for Control and Prevention of Dental Caries, U. G. Rickert, J.A.D.A., March, 1923, Vol. 10, p. 231.

Study of Salivary and Blood Calcium in Pregnancy, U. G. Rickert, J.A.D.A., September, 1924, Vol. 11, p. 783.

Experimental Feeding with Monkeys, Percy R. Howe, J.A.D.A., December, 1924, Vol. 11, p. 1194.

Experimental Effects of Deficient Diet on Monkeys, Percy R. Howe, J.A.D.A., December, 1924, Vol. 11, p. 1161.

Alterations in Blood and Saliva, E. H. Hatton, J.A.D.A., December, 1924, Vol. 11, p. 1166.

Neutralization of Bacterial Toxin, T. B. Hartzell and W. P. Larson, J.A.D.A., March, 1925, Vol. 12, p. 271.

Experiments on Destruction of Human Enamel, T. B. Hartzell, J.A.D.A., July, 1924, Vol. 11, p. 64.

AN INVESTIGATION OF INAVA ENDOCORPS VACCINE*

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WITHIN recent date, a substance known as the inava endocorps vaccine has been placed on the dental market in America, and there is no doubt that it will be tried and used by many members of the profession as have so many other remedies, bacterial, medicinal or physiotherapeutic, that have preceded it. This proprietary stock vaccine of unusually high bacterial concentration has been perfected by Dr. L. Goldenberg of the Pasteur Institute, Paris, for local injection into the areolar mucosa beyond the gingiva, as an aid in the treatment of such conditions as pyorrhea alveolaris and other periodontal infections. According to Dr. Goldenberg, the vaccine is made from the various micro-organisms that constitute the usual flora found in pyorrheal pockets, except the Vincent organisms, which are not easily cultured. At first, European and, later, American dentists were invited to investigate the merits of the vaccine clinically. The reports received were very favorable. The manufacturers are frank in their insistence that favorable results should not be anticipated unless the usual operative procedures employed in the treatment of suppurative periodontoclasia are carried out painstakingly in conjunction with the vaccinations. Evidently, the strongest claims made for the vaccine are that it creates a local relative immunity and that it minimizes the chances for reinfection.

While this vaccine may have more or less value as an accessory in the treatment of some cases of suppurative periodontoclasia, the Research Committee of this Academy would probably not have considered it important enough to make it the subject matter of its annual report this year were it not for the fact that the list of dentists who submitted favorable reports in a printed compendium on the therapeutic value of the vaccine included several men who are preeminent within the ranks of writers and educators. Their sincerity is beyond question. Since the influence that their reports, individual or collective, may have on the profession is likely to be far-reaching, the Research Committee considered it pertinent to present a detailed report that I had recently submitted to an investigating group under whose observation I carried on tests to ascertain the efficiency of the inava endocorps vaccine. The group consisted of the following members of this Academy: Drs. Lillian Barkan, New York; Leroy Edwards, Brooklyn; Michael McCaughey, Brook-

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†Chairman, Committee on Scientific Research.

lyn, and Arthur H. Merritt and Paul R. Stillman, New York. Dr. I. S. Miller, of Jersey City, one of the patients experimented on, was also present at the various sessions. The foregoing committee examined the cases before the test was begun, and at a reasonable time after its conclusion, Dr. John O. McCall, New York, examined the cases. The clinic assistants also followed the behavior of their respective cases. The late Mr. W. Linford Smith, of Lee Smith & Co., American distributors of the vaccine, was an interested lay spectator. It may be opportune at this point to say that his interest in this series of tests centered on the scientific rather than on the commercial value of the vaccine. He was eager to discover whether the vaccine had any shortcomings. He wished to make sure that the findings of the European investigators were accurate before he released the vaccine in America and Canada. It was due largely to his suggestion that our group was originally called together by Dr. Stillman, more than a year ago. I feel that I voice the sentiment of the members of the group when I say that we regret exceedingly Mr. Smith's untimely death.

When the cases to be used in our tests were selected, it was decided to exclude the average simple cases of suppurative periodontoclasia. It is well known that such conditions, in the hands of an experienced operator, are usually cleared up in a short time, with uneventful regularity, with a definite, marked improvement at each step in procedure and with slight variations in degree in different individuals. It is evident that the accessory use of vaccine or any other medium in such cases could not be given any definite measure of credit for the results obtained. In this connection, I should like to cite a case in private practice. The patient had a fairly advanced suppurative periodontoclasia accompanied by a very conspicuous gingivitis, but within less than a month, the mouth looked and felt entirely well. Had the vaccine been used in conjunction with the treatment of this case, it would have made a banner case for the sponsors of the vaccine. This case also serves to lessen our confidence in the use of control cases in these tests. It was therefore a difficult matter for me to find a sufficient number of cases that were locally suitable for the experiment involved. Only eight patients were selected during a period of several months' search. Two of these were eliminated by the physician as grave risks for vaccination purposes.

I was fortunate in securing the following varieties of cases:

Case 1. Ordinarily considered hopeless. An attempt was made to better prognosis by the use of the vaccine.

Case 2. Same as Case 3, but treated by clinic assistant.

Case 3. A difficult case, treated by an expert, in which prognosis ordinarily could be favorable only through the aid of radical surgery. It was hoped to eliminate the necessity of this by using the vaccine.

Case 4. A case not quite so difficult, ordinarily, which had received no operative treatment; used merely for the purpose of testing the extent of the effect of the vaccine on pus formation.

Cases 5 and 6. Treatable but difficult cases, which were unsuccessful in the hands of clinic assistants, selected to determine whether the vaccine would be the deciding factor in obtaining success.

I feel that it is only fair to state that six tests are rather a small number upon which to base an unbiased opinion; nevertheless, the results obtained may be considered suggestive.

The preparation of cases for treatment consisted of a thorough physical examination by an internist, an analysis of urine and blood, and the bacteriologic examination of smears and cultures from the pyorrheal pockets, both qualitative and quantitative. Parallel bacteriologic tests were carried out independently by two bacteriologists, and their findings were checked by a third.

Fig. 1 (Case 1).—Left upper second molar, showing radiolucency at the bifurcation, which usually indicates a poor prognosis.

These men, as also the internist, are of unquestionable standing in their respective specialities. Reliable radiograms and stereoscopic photographs were secured of the areas observed. These bacteriologic and photographic records were used for a comparison later on, with those made a reasonable time after the completion of the vaccine therapy series.

Although the producers of the vaccine suggest that operative treatment be given during the course of injections, we followed a different procedure for experimental purposes. The cases were divided into three groups. The first group received treatment according to the recommended technic; the second received operative treatment prior to the vaccinations, and the third, after the completion of the series. It should be emphasized, however, that the directions furnished with the vaccine were strictly adhered to in the matter of technic and frequency of injections. In the presentation of records, the following sequence will be noted in each case: (1) clinical condition of the area observed before any treatment whatever; (2) treatment received prior to vaccine therapy; (3) condition at the time of first injection as noted by observation group; (4) operative treatment during course of vaccine therapy; (5) condition after first series of injections as noted by the group; (6) operative treatment after the first course of vaccinations; (7) condition after the second series of vaccinations; (8) treatment after postvaccine observations; (9) present condition, and (10) outstanding observations in regard to the relation of the vaccine to the progress of the case.

REPORT OF CASES

CASE 1 (Fig. 1).—*Area of observation, upper left second molar.* I. M., a dentist, aged 35, before any treatment whatever presented the following condition: There was marked destruction of the alveolar septum between the upper left second and third molars, up to and far beyond the distal bifurcation of the former. The septal gingiva was hypertrophied, inflamed and funneled out by much food impaction, which seemed to be the chief exciting factor and which also helped to induce exudation of pus at the buccodistal side. This also resulted in elongation, producing traumatic occlusion. Generally speaking, the case was considered a hopeless one from the start, but the patient, who is greatly interested in periodontology, volunteered to test in his own case the possibilities of the inava endocorps vaccine.

About six months prior to vaccine treatment, the food impaction was entirely

eliminated, traumatic occlusion was removed by grinding, and apoxesis was carried out as well as possible under the circumstances. Proper hygiene, and stimulation through brushing the teeth, were established. The interproximal cervical cavities were filled.

Fig. 2 (Case 2).—Left lower central incisor.

At the time of the first injection, as was noted by the observation group, the interproximal gingivae had grown back to normal in form, color and position, which indicated the complete elimination of food impaction. However, the buccal alveolar gingivae felt tender to pressure at times and the tooth that had again elongated, causing traumatic occlusion, felt sore, occasionally, on mastication, so the patient avoided both eating and brushing on that side. Suppuration was not in evidence after the completion of treatment, but pus was expressed unexpectedly at the time of the inspection by the group.

Fig. 3 (Case 2).—Appearance of mouth prior to vaccine therapy; photographed before expressing pus; showing shrunken remnants of hypertrophic tissue labially to the left central incisor, also marginal gingivitis in various parts of the mouth.

Fig. 4 (Case 2).—Appearance of mouth, showing small drop of pus expressed labially.

During the course of the vaccinations, no operative procedures were carried on.

After the completion of the series, the patient told the observation group that he thought he felt better. Pressure in the same

Fig. 5 (Case 2).—Lingual view taken at the same time as Figure 4, showing the inflamed areolar mucosa interproximally between the left central and lateral incisors.

place as observed the first time failed to produce pus.

No second series of injections was given.

After completion of the injections, the recurring traumatic occlusion was corrected and apoxesis again carefully carried out.

About four months after the vaccine series, tenderness was felt on digital pressure about the apical region of the mesiobuccal root. The distobuccal pocket was closed, but the insertion of a probe far into the distal bifurcation from the palatal aspect brought a copious flow of thick pus followed by blood, not unlike that in the lancing of a parietal ab-

Fig. 6 (Case 2).—Case after vaccine therapy. The labial side shows the drop of pus no less than before, while the lingual shows the inflammation of the areolar mucosa but slightly lighter, if at all.

scess. This relieved the patient, but the tooth was subsequently extracted.

Ordinarily, suppuration may be stopped without the correction of traumatic occlusion provided apoxesis is thorough. In this case, where the latter was practically impossible, the vaccine did not seem to push the case over to final success. The patient, being a dentist, was interested, as was the observation group, in finding out whether the apparently inevitable loss of the tooth could be postponed or entirely averted. It is evident that the vaccine had at best a slight effect. This effect was transitory and, in fact, passed away so soon as to make it evident that its value in this case was negative.

CASE 2 (Figs. 2-6).—*Area of observation, lower left central incisor.* M. O., a salesman, aged 30, before any treatment whatever, presented a generalized suppurative periodontoclasia. The lower left central incisor had an unusually long vertical cleft down the labial gingiva opposite the center of the tooth. The lips of the cleft were highly inflamed and hypertrophied, keeping the denuded root surface entirely covered. A fairly large drop of pus could be expressed labially from either side of the cleft and from beyond the apex of the cleft by pressure about these areas, and also pressure on the lingual alveolar gingiva produced pus at the labial cleft. Traumatic occlusion was marked. The pulp was vital.

The patient was treated by a visiting dentist in a periodontia clinic about eight months

Fig. 7 (Case 3).—Left upper cuspid area.

prior to the vaccine therapy. His treatment was along lines of routine conservative procedures, including correction of traumatic occlusion. The result was a fair improvement generally and a marked improvement in the appearance of the area under observation. A slight amount of pus was still in evidence. The patient volunteered the information that, soon after he had commenced his summer vacation, he could not succeed in pressing out any pus, and it was not until several weeks after his return home that a slight amount of pus was again present. After the correction of a recurring traumatic occlusion, a deep apoxesis was done by myself. I worked around the lingual side of the tooth as far as possible, by way of the distolabial pocket. The pus exudation ceased for a short time, but several weeks later, a painful swelling appeared on the areolar mucosa bordering on the gingiva, lingually to the incisor. This soon emptied its contents through the distolabial pocket.

At the time of the first injection, this condition had taken on a chronic aspect. Pressure on the slightly swollen lingual area easily caused a drop of pus to appear labially where the gum, receding into a hard consistency, uncovered the root surface formerly hidden from view by the hypertrophied flaps. The pulp continued vital. Marginal gingivitis was present in various parts of the mouth.

No operative treatment was given during the first vaccination course.

After the first series of vaccinations, the generalized marginal gingivitis continued unchanged and the pus exudate, in the area observed, was the same as before.

One month after the completion of the first series, the recurring traumatic occlusion was corrected and the root was curetted as thoroughly as possible through the distolabial

Fig. 8 (Case 3).—Right upper lateral incisor area.

pocket. The next week, the pus was reduced to about one-quarter. I then curetted through a small buttonhole incision on the lingual side. A week later, the pus continued as before. I again curetted slightly. The next week, more pus appeared than ever before.

Subsequently to the second series, I curetted twice through the lingual opening, and there was a slight improvement.

The present condition seems to be good, though there is still a suggestion of the existence of pus.

The outstanding features are the facts that the marginal gingivitis was evidently not affected by the vaccine; that the flow of pus was not affected even after operative encouragement, and that, on the contrary, an increased flow of pus occurred during the period prior to the second series. A second series brought no visible improvement.

CASE 3 (Fig. 7-10).—*Area of observation, upper left cuspid.* K, an illustrator, aged 35, before any treatment whatever, presented the following condition: A deep pyorrheal pocket, distally, branched off into a

Fig. 9 (Case 3).—Appearance of mouth before vaccine therapy. The drop of pus expressed on the labial side of the right lateral and one on the distolabial side of the cuspid may be noted.

labial and a palatal spiral. The tooth was in severe traumatic occlusion and had a mobility degree of one-half. The pulp was vital, and pus was plentiful. Throughout the mouth, the occlusion was exceedingly poor. The advanced periodontoclasia, owing to badly disarranged arches and the spiral character of

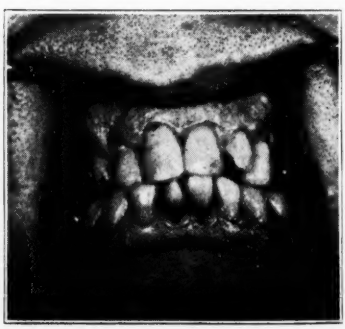

Fig. 10 (Case 3).—Appearance after treatment, showing no diminution in the amount of pus.

many of the pockets, gave the case, as a whole a poor prognosis.

The condition in the area under observa-

tion did not clear up after routine treatment, and as the patient refused to undergo surgical operation, work was discontinued. Vaccine therapy was instituted nine months later.

At the time of the first injection, the observation group noted that the tooth had re-elongated, causing a traumatic occlusion, and that there was much pus and a deep spiral pocket.

No operative treatment was given during the course of vaccinations.

The condition remained unchanged after the completion of the first series of vaccinations.

Four months later, January 23, I corrected the traumatic occlusion and curetted the tooth, but, after two weeks, the condition was still the same. A second series of vaccinations was

Fig. 11 (Case 4).—Right upper central incisor area.

started February 28. Between the ninth and tenth injection of the second series, an acute parietal abscess, with a marked and pointing swelling, developed on the distopalatal side of the first bicuspid. Incision brought slight relief, but a copious flow of pus at the point of incision continued for several days.

After the second series of injections, the condition remained unchanged.

I then curetted the cuspid, and still there was little improvement. Finally, the pocket was partly eliminated by excision. This effected direct access to the spiral pockets, and the pus formation ceased.

The outstanding features in relation to the vaccine therapy in this case are: The development of an acute parietal abscess opposite the distal side of the upper left first bicuspid just before completion of the second series would seem to indicate that the local immunity to infection was not raised; either this, or it becomes necessary to assume that an increased local sensitization to previously latent irritation was produced. The ultimate effect of

Fig. 12 (Case 4).—Appearance of mouth before vaccine therapy. The drop of pus expressed at the mesiolabial side of the right central may be noted.

the vaccine, if any, is thus left in a state of uncertainty, as cessation of pus around the cuspid, which would indicate improvement, did not occur even with curettage; whereas, the pus from the bicuspid that was not in the

Fig. 13 (Case 4).—Appearance after vaccine treatment. Evidently, the quantity of pus is not reduced.

area of original observation did cease after curettage.

CASE 4 (Figs. 11-13).—*Area of observation, upper right central incisor.* H., a dental student, aged 25, before any treatment whatever, presented deep suppurative mesiolabial pocket. The tooth was in traumatic occlusion, with a mobility degree of 1, and the pulp was vital. The patient had received no operative treatment prior to vaccination.

The operative treatment during the course of vaccine therapy consisted only of a partial curettage at the time of the ninth injection.

After the series of vaccinations, the condition was the same as before, and Mr. Smith suggested that the case should have no further

Fig. 14 (Case 5).—Right lower lateral incisor area.

operative treatment so that any cumulative effects of the vaccine might be observed.

After a period of thirty days, no cumulative effects, good or bad, could be noted. I corrected the traumatic occlusion and took other steps in the regular procedure. Ten days later, the amount of pus was less.

The outstanding observations are as follows: Continued suppuration is not ordinarily expected in this type of case in routine treatment given without vaccine. This may have been due to deposits that could not be reached by the usual methods of scaling. It could not be observed that the vaccine gave better results than would have been obtained without it.

CASE 5 (Figs. 14-15).—*Area of observation, right lower lateral incisor.* E., a salesman, aged 28, before any treatment whatever, presented the following condition: localized subacute gingivitis and periocementitis; whitish pus; gingival recession, and a deep pocket labially with comparatively little serumnal deposits. The pulp was vital; the degree of mobility one and one-half; and in various locations about the mouth, an incipient periodontoclasia was evident.

In addition to specific medication against subacute infection, routine treatment was given at the clinic about two months prior to vaccine therapy.

This case was not seen by the observation group prior to vaccine treatment; but was witnessed by my associate and the clinic assistant. A stereoscopic photograph then taken indicates that the gingival margin was still

Fig. 15 (Case 5).—Appearance of mouth before vaccine therapy. The pus expressed in this case was unusually white, which made it difficult to bring out the condition, photographically, with any degree of contrast to the crown. Stereoscopically, it can easily be seen. No photograph was taken after treatment. The amount of pus remained the same.

inflamed and that pus flowed freely. A slight amount of serumnal deposits was still present at the apex of the pocket. Pressure with a blunt instrument against a linear depression in the gingiva brought out more pus than is seen in the photograph.

Between the sixth and seventh injections, the operator curetted very conscientiously, with the consequence that the gingiva looked healthier and the pus was reduced considerably. Between the ninth and tenth injections, the operator further ground and curetted the tooth observed. The next day,

at the time of the tenth injection, the amount of pus increased to greater proportions than at the beginning of treatment, although, only two days earlier, it was at its minimum.

After the first series of vaccinations, the patient was observed by the operator, my associate and me. This area looked very much as it did before the vaccinations.

The clinic assistant continued operative treatment for several weeks, with but slight improvement. I then gave a thorough curettage, with favorable results.

The area continues healthy.

The outstanding observations are as follows: The marked improvement after the

Fig. 16 (Case 6).—Left lower central and lateral incisors.

treatment between the sixth and seventh injections was possibly due to special effort at more thorough work on the part of the operator rather than to a raised immunity. Since similar attempts between the ninth and tenth injections eventuated in an aggravated condition, there was probably a lowered immunity, perhaps general, and having no connection with the vaccine treatment. At any rate, there seems to have been no evidence of any special benefit from the vaccine.

CASE 6 (Figs. 16-17).—*Area observed, lower left central and lateral incisors.* A woman, married, aged 28, before any treatment whatever, presented the following condition: suppurative periodontoclasia about the central incisor on the labial side only, with mobility degree, one and one-half. The lateral incisor was equally loose, but though the lingual pocket was slight, the one on the labial side was extensive and the alveolar process distally was exposed to the instrument and evidently pathologic. The pulp was vital.

Prior to vaccine therapy, routine treatment by a clinic assistant was unsuccessful.

Mobility and pus at the time of the first injection were the same as before operative treatment. Injections were witnessed only by the clinic assistant and my office associate.

During vaccine therapy, operative treatment was continued by the clinic assistant.

The condition after the course of vaccinations was the same as before.

Ten days after completion of the series

Fig. 17 (Case 6).—Appearance before beginning of vaccine therapy. A drop of pus, expressed from the pocket of the lower left lateral incisor may be noted. The same sized drop could be seen after the completion of the course of vaccinations.

and again four days later, the case was treated by me.

The condition at present seems to be healthy.

The outstanding feature is that the reaction to treatment was not any better when in conjunction with the vaccine than without it, and that the final improvement could properly be attributed to more thorough operative technic.

SUMMARY

1. All cases selected for our tests were suppurative periodontoclasia, as the main object of these experiments

was to test the effect of the inava endocorps vaccine on pus formation.

2. The average simple cases of suppurative periodontoclasia were excluded in making selections for the tests, as the value of the vaccine could not be measured definitely since successful results are usually obtained in such cases without the accessory use of a vaccine or other medium.

3. I appreciate the importance, from a strictly scientific point of view, of having a large number of test cases. Our number was limited to six because it was difficult to find cases that were suitable locally for the experiments, and because two out of the eight patients originally selected were eliminated by an internist as grave risks for vaccine therapy.

4. When apoxesis could not be carried to completion without a radical operation because of a markedly spiral shape of the pockets, the accessory use of the vaccine apparently did not help to lessen pus formation. Usually, when apoxesis is carried out completely and thoroughly, suppuration ceases automatically.

5. The observation group noted that the generalized marginal gingivitis in Case 2 remained unchanged after the completion of the vaccine course.

6. In Case 2, also, the pus formation, instead of diminishing, increased greatly after the first series of injections, and the second series left it in the same condition as at the beginning of treatment.

7. In Case 3, a parietal abscess developed beyond the area under observation toward the end of the second series of injections, while, at the same time, the pus formation remained unchanged in the area originally observed. These facts seem to indicate that the local immunity had not been raised by the use of the vaccine.

8. In Case 5, in which operative treatment was carried on in conjunction with the vaccine therapy as stipulated by the manufacturers of the vaccine, a conscientious attempt at apoxesis by the clinic assistant resulted in a greatly increased flow of pus, which eventually subsided to the original quantity. The vaccine apparently did not benefit this case.

9. In Case 6, operative treatment by a clinic assistant did not bring success. We then used the vaccine in conjunction with his operative treatment and the result was still unsuccessful. It was not until after a more skilful apoxesis was made by an experienced operator, some time after the completion of the vaccine series, that the desired result was attained.

TABLE 1.—BACTERIOLOGIC FINDINGS IN SMEARS FROM MOUTH*

Patient		Pus Cells	Spirilla	Fusiform Bacilli	Cocci	Miscellaneous
M. O.	Before	Few, degenerated	81%	6%	13%	None
	After	Many, well preserved	Occasional	Occasional	About 100% diplococci	None

*Percentage differences are valid only when made on the same total counts. This is hardly possible on smears. No conclusion can be drawn from these tables. They are presented merely to indicate where erroneous conclusions might be drawn.

Patient	Pus Cells	Spirilla	Fusiform Bacilli	Cocci	Miscellaneous
J. H.	Before Many	20%	10%	70%	Occasional streptothrix
	After Many	Occasional	13%	86%	None
I. M.	Before Few, degenerated	10%	15%	75%	Streptothrix
	After Few	Occasional	53%	46%	Occasional
K.	Before Many, well preserved	Masses	57%	43%	None
	After Large number well preserved	Myriads	Only occasional	Occasional	None

TABLE 2.—FINDINGS IN CULTURES

Patient	Colony Count	Smears from Cultures on Loeffler's Blood Serum Medium
M. O.	Before 2 loops, 3 colonies to sq. mm. 1 loop, no growth	No streptococci seen; many gram-positive staphylococci; many gram-positive lancet shaped diplococci; large number large gram-negative diplococci
	After 2 loops, 12 colonies to 1 sq. mm. 1 loop, 10 colonies to whole plate	Moderate pneumococci; moderate Micrococcus catarrhalis (group); no streptococci seen
J. H.	Before 2 loops, about 5 colonies to a 100 mm. plate 1 loop, no growth	No streptococci seen; few gram-positive lancet-shaped diplococci; moderate large gram-positive cocci, occurring in tetrads
	After 2 loops, whole 100 mm. plate, 2 colonies 1 loop, whole plate no growth	No streptococci seen; new lancet-shaped diplococci, probably pneumococci; occasionally large diplococci, probably micrococcus (catarrhalis group)
I. M.	Before 2 loops, plate entirely overgrown 1 loop, plate entirely overgrown	No streptococci seen; many gram-positive lancet-shaped diplococci; many gram-negative diplococci.
	After 2 loops, 12 colonies to 1 sq. mm. 1 loop, 32 colonies to whole plate	Moderate pneumococci; few Micrococcus catarrhalis (group); few Micrococcus tetragenes; no streptococci seen

Patient	Colony Count	Smears from Cultures on Loeffler's Blood Serum Medium
K.	Before	
	2 loops, 20 colonies to sq. mm.	Gram-positive, lancet-shaped diplococci occuring in pairs and in from long to short chains
	1 loop, 14 colonies to sq. mm.	
	After	
	2 loops, 96 colonies to 1 sq. mm.	No streptococci seen; few Micrococcus catarrhalis (group) and moderate number of pneumococci
	1 loop, whole plate, 32 colonies	

MINORITY REPORT ON VACCINE TREATMENT IN PERIODONTIA

By JOHN OPPIE McCALL, D.D.S., New York City

I HAVE asked the privilege of incorporating this report in the report presented by the Chairman of the Committee in order to call attention to certain facts which seem to be worthy of further study. Let me say, first, that I have seen the cases which form the basis of the Committee Report and concur with the findings as reported. In spite of the conclusions reached by the Committee, which seem to be arrived at fairly, I have not entirely relinquished my belief, founded in part on clinical experience, that the inava vaccine has some beneficial effects. I have, therefore, felt that further study would be desirable either to corroborate or to disprove this conviction.

In the bacterologic reports, it is interesting to note that, in certain instances, the number of colonies of bacteria is less at the conclusion of the test than at its beginning. Let me supplement this statement with the observation which I have made on several occasions from examination of smears that, after the use of the vaccine, the number of free bacteria is notably lessened and sometimes entirely lacking. At the same time, pus cells have been seen and have been found to contain within themselves many bacteria. The conclusion which I have drawn from this is that the vaccine has induced a higher degree of phagocytosis than would otherwise occur, it being, of course, recognized that phagocytosis is one of the functions of those blood cells which later become pus cells.

Needless to say, the pus cells and bacteria must both disappear before the treatment can be considered successful; also, in a hopeless case, we cannot expect greater benefit with the vaccine than without. But, in many of my cases in which the prognosis was favorable but the patient's resistance evidently low, I have felt that greater benefit was given by the use of the vaccine. The evidence in these my cases has been clinical rather than scientific, yet it is suggestive.

My suggestion is that parallel series of treatable cases be carried through, one with and one without vaccine, and

a record be kept of the findings disclosed by smears, as treatment progresses, all cases to be controlled, as far as may be possible, by blood examination, etc.

In the report of the Committee there are references to several instances in which the amount of pus has increased during treatment. On questioning Dr. Hirschfeld, I found that he had been giving the injections every second day according to the original instructions sent out with this vaccine. This was also done by other early users of this vaccine. This is mentioned for the reason that these investigators reported a diminution or cessation of pus; whereas, Dr. Hirschfeld reports an increase in pus flow in several cases. Knowing that the usual custom in medicine is to give vaccines at intervals of three or four days, I had early changed my practice in this respect. In support of this practice, I might call attention to the fact that the latter instructions inclosed with the vaccine called for injections at the three-day interval. The theory of vaccine therapy is founded on the supposition that the opsonic index is depressed during the first day or two after injection, and then begins to rise. The effort in vaccine therapy has been to give the successive injections at a time when the opsonic index was high, in order that further depression might be avoided and the index raised to a still higher point. Price has reported unfavorable results with the injection of too large a quantity of vaccine, a finding which would agree with the theory just stated. It, therefore, seems desirable to carry on other tests similar to those of Dr. Hirschfeld, with the vaccine used at intervals of three or four days, to determine whether this variation in the procedure will make any difference in the results.

DISCUSSION

Justin D. Towner, Memphis, Tenn.: It is especially fitting that Dr. Hirschfeld and his Committee should investigate and direct attention to a phase of therapy so in need of scientific examination. His attempt to determine the rationale of vaccine treatment deserves commendation and the report merits critical consideration. The Committee on Scientific Research has a great responsibility in protecting and educating the profession, and I, for one, am in hearty accord with their efforts even though our opinions, at times, may differ. Since the study of periodontal tissues, and the treatment of pathologic process incident thereto, became prominent, the profession has been deluged with various therapeutic remedies unsupported by sufficient clinical tests to prove their claims as panaceas or even desirable adjuncts in practice. This has created a false conception of the true office of such agents and resulted in the "doping" of these membranes to the point of paralysis. The fact that drugs or vaccines alone will not cure periodontal disease should be emphasized to such a degree that sole dependence will no longer be placed in them. Intelligent therapeusis, either local or systemic, demands only the use of simple agents which stimulate the normal function of tissues and exert a protecting influence. It should be known, ere this, that there is no specific against a mixed infection which has such a wide range of variance as that found in gingival crevices. This variance is noted not only in different mouths but also in different areas of the same mouth. The only true claim to be made for the best of such preparations is that they are simply adjunctive. In the realm of vaccine therapy, persistent effort has been made to produce a preparation which will fortify the organism against the infectious process coincident with periodontoclasia. The autogenous variety gave greater theoretical promise of benefit and would doubtless have come into more general use had it not been difficult to manufacture at the time and place of treatment. Sufficient experience was had, however, to demonstrate its failure as either a systemic or a local immunizing agent. Then heterogeneous vaccines, designed to cure by the same process of general immunity, were introduced and met the same fate for the same reason: failure to increase local resistance sufficiently. Inava

endocorps vaccine, made the subject of more thorough investigation by this Committee, as well as others, evidently profited by the failures of those preceding it, and has been designed to deliver its benefit directly through improved local tissue function. This is more rational than any attempt to effect a cure, or produce immunity, by creation of antibodies in the blood. There are too many detrimental local influences, other than infection, in the majority of mouths for any vaccine successfully to combat for a long period of time. In my clinical investigations of vaccine therapy, the futility of control cases and bacteriologic findings was recognized and dispensed with for obvious reasons. In view of the further fact that no such treatment could effect a desirable result without the intelligent application of surgical, operative and mechanical procedures, no reliance has been placed on the immunizing effect alone. Accordingly, then, all such agents have been used purely as adjuncts and the results carefully noted. A recitation of several cases reported last October in which the Goldenberg vaccine was employed will serve to explain the technic used and effect obtained. Recent observation of several of these patients gives evidence of substantial recovery, which, after all, is the desired end.

CASE 1.—S. E. R., a man, aged 45, an alcohol addict, suffered from digestive derangement and low physical resistance. He took poor care of the mouth tissues. Deep periodontoclasia was present, complicated with Vincent's infection and a severe abscess between the roots of the lower central incisors. The abscess was drained for relief and all gingival crevices and gums were sprayed with a mild solution of sodium chlorid, benzoic acid and sodium perborate. The Vincent's infection was relieved with 7 per cent chromic acid, applied once daily for a week, and 5 per cent sodium perborate used as a mouth wash every three or four hours. No instrumentation was used or other treatment given until all evidence of this specific infection was relieved. Surgical removal of deposits and necrotic periodontal tissues was followed by slow and incomplete recovery. Finally, from May 22, 1924, to June 23, 1924, inclusive, a series of ten injections of inava endocorps vaccine were given with the happy result of rapid recovery and apparent cure. Each of the last seven doses produced a decided reaction. Salivary calculus accumulates quickly in the mouth and is now deposited on a number of teeth but the gingivae are not inflamed. This is a rather definite evidence of raised local resistance.

CASE 2.—A. S. J., a woman, aged 60, who was very delicate, extremely nervous and anemic, suffered from alveolar resorption, pronounced serumal deposits and excessive gingival detachment, with little or no evidence of inflammation. The personal mouth care was good. The patient was a malarial type. The excessive gingival tissue about the molars was resected, the alveolar borders were curetted and the tissues protected with a surgical dressing, and the patient was referred to her home dentist, with directions for postoperative treatment. On her return, after several weeks, the tissues were not healed. Three injections of inava endocorps vaccine were made within a week and rapid healing and tissue tone were secured. There was some reaction from the third dose. The patient could not remain longer, and I have had no opportunity to see her since, but I am advised that she is much improved.

CASE 3.—R. B. S., a woman, aged 52, of good physique, should no evidenc· of disease except in the mouth and that between the first and second molars on both sides, above. The entire mouth was treated several years ago, and with periodical prophylaxis, there has been no relapse except for the pockets mentioned. After correction of the occlusion, the tissues on these areas were resected and curetted, and protected with a surgical dressing. A course of ten injections of inava endocorps vaccine was then given without any sign of reaction. Sufficient time elapsed before the patient went abroad to note a complete healing.

CASE 4.—E. B. W., a woman, aged 50, in poor physical condition, overweight and suffering from metabolic disorders, had had splendid periodontal care the past three years, with no substantial benefit. All the teeth were condemned except the lower anteriors. These were treated surgically and with inava endocorps vaccine, while the posterior teeth above and below were extracted serially. The upper anterior teeth were left in place for a time, to maintain the bite and for esthetic reasons. During the vaccination period, which was marked by pronounced reaction, I noticed that the upper anterior gingivae were gradually

becoming more normal in color, and at the time these teeth were extracted, the adjacent soft tissues were apparently healthy. Considering the fact that no vaccine had been injected in the upper mouth and no treatment of any kind had been given these tissues, the improvement was especially noticeable. Later, evidence of Vincent's infection appeared about the lower teeth but was promptly relieved with a few applications of 7 per cent chromic acid. The mouth is now very healthy and serviceable.

CASE 5.—J. A. T., a man, aged 56, a former syphilitic, with low resistance complicated with gallbladder and kidney stones, suffered from low grade and persistent infection of the periodontal tissues. As ordinary treatment proved inadequate, radical surgery was resorted to, slow resolution resulting. To hasten complete recovery, inava endocorps vaccine was used in various parts of the mouth. The reaction from each dose was so objectionable to the patient that he quit after the seventh injection. Several months later, the dentist who referred him called me by phone to compliment me on the result. A week or two after this, I called the patient in for inspection and was gratified to see no evidence of disease. This patient died recently as a result of a gallbladder operation, so an interesting study case has been lost.

Attention is called to the fact that, in my opinion, vaccines are not to be considered immunizing agents when used in the treatment of periodontal diseases. And further, that my investigation of and report on inava endocorps vaccine deals only with its adjunctive properties. In support of this I said in my report: "Clinical evidence in many cases of persistent periodontoclasia supports the claim that inava endocorps vaccine is a desirable adjunct in treatment. Just how substantial this evident benefit will be remains to be proved in future years."

Dr. Hirschfeld (closing): In the compendium issued by Lee S. Smith & Son, there is printed a translation from the French, of a paper by Dr. L. Goldenberg, who evolved the vaccine in question. In it, he points to suppuration as the capital symptom of pyorrhea alveolaris and stresses emphatically the primary importance of clearing up this pus formation. This, he proposes to accomplish mainly by local immunization with the vaccine. How well, if at all, the vaccine will do this was the main object of our group's investigation. I feel that a perusal of the Committee report fails to show any clinical evidence that local immunization was accomplished by the employment of the vaccine in the cases tested. It is interesting to note that Dr. Towner, in summing up his discussion of the report, frankly calls special attention to the fact that, in his opinion, vaccines are not to be considered immunizing agents when used in the treatment of periodontal disease. He also says that his investigation of and report on inava endocorps vaccine deal only with its adjunctive properties. If his case reports indicate any evidence of adjunctive properties of the vaccine, they are apparently only in the way of hastening resolution in tissues operated on surgically in patients of low vitality (Cases 1, 2 and 5) and not in combating infection. This, of course, is interesting, but, I believe, has no particular bearing on the contents of our report except that, in the cases tested by us, there seemed to be no indication of adjunctive qualities of the vaccine. In Dr. Towner's Case 3 (a patient generally healthy), suppurative periodontoclasia had been successfully treated at some previous time, except in two places in which there had been a recurrence. Here, a very important etiologic factor, namely traumatic occlusion, was later corrected and the periodontium treated surgically. Usually, this alone suffices to yield good results. Whether or not the additional use of the vaccine was of any special benefit is not evident. I should like to suggest that Dr. McCall have the whole hearted encouragement of the Academy in further investigations, which, according to indications in his minority report, he contemplates making in the near future. His findings, positive or negative, should yield valuable information.

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Editorial

THE FEDERATION DENTAIRE INTERNATIONALE

The function of this great international body is not well understood by the rank and file of the profession, particularly in America, and it is high time that keener interest is taken in it. It was organized in Paris in 1900, and its first president was the late Dr. Charles Godon. Its function is to direct international affairs in dentistry between congresses, and to set the time and place for these great meetings. It has held sessions annually, except during the World War, and to the honor of our profession, it was the last of the great international bodies to meet before the War (in London in 1914, just as the war was breaking out), and the first to meet after peace had been declared—thus demonstrating the greater altruistic character of our professional activities than of our political and national ambitions. As has so frequently been said, science knows no national barriers nor provincial prejudices.

The Federation has exerted a most benign influence on the

profession the world over, and, as now constituted, it claims membership in thirty-five countries. It will thus be seen how comprehensive is its function. It is divided into various commissions and activities, such, for instance, as the Commission on Education, on Legislation, the Red Cross, on Documentation (bibliography, statistics, etc.,) on Scientific Research, on Dental Hygiene, on Dental Press, on Army and Navy Dental Service and on Criminology.

It is, therefore, very far-reaching in its scope, and it would be difficult to name a single activity having to do with professional policy in which it is not interested.

It has been accorded, in the various countries where it has met, the sanction of government, and, in at least two instances, it has been received by royalty—in 1912 in Sweden, when His Majesty the King received the Executive Council in his royal palace, and in 1922 in Madrid, when His Majesty the King of Spain presided over the opening session and addressed the Federation in commendation of its humanitarian work. On this occasion, the cabinet members attended the King in a body.

It is therefore safe to say that the International Dental Federation has had more to do with gaining for dentistry a proper recognition on the part of governments than has any other agency. It has also brought the dentists of the different countries into a closer communion than was ever dreamed of before its organization, and it is thus entitled to the active support of every reputable dentist in the world. It is today the stable link that binds the dental profession of the nations into one cohesive body, with similar interests and ambitions, thus giving a status to dentistry never before obtained.

It enjoys the membership of the most noted men in the profession, and its officers have been men of unusual distinction. As has been said, Dr. Godon of Paris was its first president, and following him came such leaders as W. D. Miller of Berlin and America, Emile Sauvez of Paris, W. B. Paterson of London, and Truman W. Brophy of Chicago. Its present president is Dr. Floristan Aguilar of Madrid. Dr. Brophy held the presidency

longer than any other man. He was elected in London after the Sixth International Dental Congress in 1914, and on account of the war, and the fact that the Seventh International Congress did not convene till 1926, he naturally continued in office, a service covering twelve years. He has attended nearly every meeting since the organization of the Federation.

The dentists of the United States must, in the future, take a greater interest in this body than they have in the past. Every member of the American Dental Association should realize that our great national organization is as much an integral part of the Federation as the various state dental societies are a part of the American Dental Association. In other words, we must get out of our consciousness all ideas of insular provincialism in dental matters, and begin to realize that we are only one part of a great brotherhood of dentists the world over. When we have this idea firmly fixed in our minds, we shall all assume a more enlightened attitude toward the International Dental Federation. The next meeting will be held in Copenhagen in 1927, and as many of our American colleagues as can make it convenient should attend.

THE 1927 MEETING OF THE AMERICAN DENTAL ASSOCIATION

In the great refulgence following the Seventh International Dental Congress, we must not be diverted from the importance of the next meeting of our own organization, which is to be held in Detroit in 1927. The chairmen of the various sections should begin work at once on their programs, and they should not content themselves with mediocre material for presentation at the coming meeting. There has sometimes in the past been a tendency to secure essayists without due consideration of their fitness, and, as a consequence, papers and discussions have been presented that were really not in keeping with the quality of work suited to an organization of the character of the American Dental Association. Heretofore, there has been a tacit understanding that everything presented before sections should appear in THE JOURNAL

OF THE AMERICAN DENTAL ASSOCIATION, this assuring it a wide circulation; but at the meeting of the Board of Trustees in March, 1926, a resolution was passed that only such material as was really valuable should gain access to the pages of THE JOURNAL, even though it had been presented before the Association.

Thus, it will be seen that all of those who are charged with the making of future programs must see to it that their essayists are of such character that the papers and discussions will beyond question be worthy of a place in the official publication.

A year is none too long in which to prepare and stage a program suitable for such a meeting, and our section officers should become active at once and present such a program for 1927, that the meeting may mark a definite step in advance, and maintain the best traditions of our great organization.

PRESERVE YOUR JOURNALS

There is an apparent carelessness on the part of many of our members in the matter of preserving each issue of THE JOURNAL as it comes out. Requests are frequent for back numbers to fill vacancies caused by lost or mislaid copies, and the time has come when it is almost impossible to supply any more numbers. In fact, in most of the recent months, every copy is sold out, though hundreds of extra copies were printed. The lesson is that subscribers should exercise care in preserving every issue, because of the fact that the back numbers are becoming more and more valuable, and more difficult to replace.

DEPARTMENT OF DENTAL HEALTH EDUCATION

PRENATAL AND PRESCHOOL DENTAL SERVICE*

By G. H. WANDEL, D.D.S., Iowa City, Iowa

THE tooth problem is primarily the mother's problem. Father doesn't enter into the picture much unless possibly to add some inherited tendencies for good or bad teeth. When we realize that the deciduous or first set of teeth are beginning to form about the sixth week of fetal life, that the crowns of these first teeth are almost completely formed by the time the child is born and that the crowns of four of the permanent teeth begin to show the presence of enamel and dentin about two months before the child is born, we can understand why it is mother's problem from the start. From the time the child is born until it is about 11 months of age, when it is weaned, it depends, in most instances we hope, on its mother's milk for most of its nutrition. If it is artificially fed, the responsibility is still the mother's. By the eleventh month of age, the child is about weaned and gradually, as age permits, it is given other foods. It is mother who chooses and prepares these new foods and teaches the child to eat them. This is, therefore, still her responsibility, and this state of affairs continues up to the time when the young man or the young woman starts out to make his or her way in the world and assume the responsibility for the selection of the daily dietary. Then and then only does mother's responsibility seem to end.

Nutrition is possibly one of the greatest factors in tooth disease. But there are many angles of the nutrition problem and all appear to have their bearing upon the subject.

I have mentioned the mother's responsibility during the prenatal and nursing periods but only with respect to the child. The mother also has a responsibility during these periods to herself as well. She has her own bones and teeth to consider. If there is any time a mother's teeth tend to become bad, it is during the prenatal and nursing periods. Most authorities seem to feel that the reason for this is that the fetus or child robs the mother's bones and teeth of the two principal bone and tooth forming elements, calcium and phosphorus. It appears to be a fact that even long after the mother has subsisted on a diet deficient in these salts, the child will demand its regular supply of calcium and phosphorus for the purpose of building the skeleton and teeth. If the mother does not supply this demand through the things she eats, there is only one other place for the child to obtain it, and that is from the hard tissues of the mother.

Various authorities appear to agree that about 0.67 gm. of calcium is the

*Read before the Midwinter Clinic of the Chicago Dental Society, Jan. 27, 1926.

average amount used by an adult each day. He will also use about 1.32 gm. of phosphorus in the same length of time. This average waste or use seems to go on whether that amount is contained in the diet or not. Add to that the needs of motherhood, and the calcium demand is about doubled.

The calcium and phosphorus needs of the child are greatest from about five months before birth until five years after birth. The highest demand level is reached during the nursing period. The calcium absorption during the last three months of fetal life is about twice what it was during the first six months of fetal life.[1]

Several investigators hold that the correct diet for the mother should start with the beginning of pregnancy and continue until at least six months after the child is weaned. They suggest that the mother does not tend to regain her normal balance in calcium, phosphorus, etc., until she has kept up this protective diet for about six months after the nursing period has ended, since it seems to take that much time to replace the materials sacrificed to the child.

There are certain foodstuffs that are deemed necessary during the prenatal and nursing periods, but of all of them, milk is by far the most important, and for it there is no substitute. This is just as true in the diet of the mother as in the diet of the child. Not long ago, the *Journal of the American Medical Association* made this editorial comment on milk.

> The dietary rule of a quart of milk each day for every child is more than a precept based on individual opinions or drawn by analogy from the results of feeding experiments with lower animals; it now rests on scientific evidence obtained by extensive and intensive experiments directly upon children themselves.[1]

This statement came as a result of experiments conducted by the New York Association for Improving the Conditions of the Poor, with the cooperation of the Department of Chemistry of Columbia University.

> The experiments were carried out on children from 3 years to over 13 years of age, to determine what quantity of milk per day, taken as a part of the normal diet, would induce the best storage of calcium and phosphorus in the body of the growing child and hence, presumably, the best development of bones and teeth. These very careful studies with systematic increases and decreases in the daily allowance of milk led to the conclusion that the child must be fed a quart of milk per day to insure the best results.
>
> There were also experiments to ascertain whether children utilize the calcium of vegetables as well as that of milk, and whether, with a larger use of vegetables, the consumption of milk could be reduced without detriment. The vegetables were not found able to replace even one-half of the quart of milk.[2]

Thus, we see there is no substitute for milk. It is the best all around food we have, rich in all food requirements except iron, and this lack can be offset with other foods. The diet of the expectant mother should contain at least a quart of milk a day from the very beginning of pregnancy. It is her principal protective foodstuff. The diet of the child should also contain this amount, if its age and health permit. In the child's diet not over a quart of milk per day should be given, because it does not tend to appreciably raise the calcium and phosporus level in the body,

1. McCollum, E. V., and Simmonds, Nina: Food Nutrition and Health, 1925; Sherman, H. C.: Chemistry of Food and Nutrition, New York, The Macmillan Company, 1915, pp. 262-269.

2. Sherman, H. C.: The Red Cross Courier, 4: 25 (Feb. 2) 1925.

but it does tend to crowd out other important foods.

Another group of foodstuffs that should be in the mother's diet and in the diet of the child as its age permits is the leafy and green vegetable group. This group makes up whatever deficiencies we might have in milk, and supplies minerals, vitamins and roughage. Spinach is especially rich in iron and is usually stressed in the child's diet.

Fruits form another important group. They also supply vitamins and minerals, and are a big aid to digestion. We all know the value of orange, prune and tomato juice in the baby's diet because of its vitamin C content, a protection against scurvy. This is especially true in artificially fed children. These three fruit juices also aid much in protecting the child against constipation. Fruits also serve in the same capacity for the mother. Experimental data at hand show that orange juice especially has a strong tendency to increase calcium retention in the body.[3]

The last food group emphasized in mother and child diet is the whole grain bread and cereal group. The whole grain products contain much more of vitamins, minerals and roughage than do the refined products, and in consequence are preferred. The roughage of these products aids in normal bowel movements. Cooked cereals for children are to be used largely in preference to dry cereals, being more readily digested.

Eggs are not included in the above grouping of articles of food because their nutritional character seems too distinctive to warrant their being merged with either meat or milk, while to put them in a group by themselves would tend to give an exaggerated impression of their practical and quantitative importance. In most respects, eggs may be regarded as intermediate between meat and milk, but the recent discovery that the egg yolk has special value for the prevention of rickets, due to its vitamine D content, lends new significance to the inclusion of three or four egg yolks per week in the dietaries of children under 2 years of age, or of the mother during the prenatal and postnatal periods.[4]

Many pediatricians do not add egg to the diet of the child until he is 1 year of age, because of the fact that many children under that age do not seem to be able to handle egg in the diet readily.

Still another factor that is gaining recognition for prenatal and postnatal protection of mother and child, especially from the standpoint of calcium and phosphorus retention, is vitamin "D," which is found in largest amounts in pure cod-liver oil. It is advisable for the mother to take this during the prenatal and postnatal periods and especially during the nursing period. It helps her absorb from her diet the maximum of calcium and phosphorus. This means a greater abundance of those materials for the growing child and a greater protection to her own bones and teeth for the same reason. It is especially stressed by pediatricians that all artificially fed children should receive cod-liver oil right from the start. This is more important during the winter months, and is a protection against rickets and other diseases, giving an almost certain guarantee that calcium and phosphorus will be retained as they should be, and thus insuring stronger bones and teeth. The use of cod-liver oil is emphasized during the winter months because it is known that

3. Chaney, M. S.: A Comparison of the Value of Milk and Oranges as Supplementary Lunch for Underweight Children, Am. J. Dis. Child., 26: 337-348, (Oct.) 1923.

4. Sherman, H. C.: Footnote 3, page 8.

sunshine plays a similar part to that of vitamin D in bone and tooth development. It is noticeable that children show a greater tendency to develop rickets during the winter months than during the summer months, and I have noticed in my examination of several thousands of children a greater tendency for tooth decay during the winter than during the summer months. It seems to be due to the fact that we have less sunshine in the winter than the summer, and what sunshine we do have is lacking in the short rays of light that are known to stimulate the child's body properly to do what it should do as regards calcium and phosphorus absorption. It does not accept, either, the sunshine coming through a pane of glass, but it must be the direct ray of the sun; because, when sunshine comes through a pane of glass, it loses the short ray that is responsible for body stimulation and absorption of calcium. When we resort to cod-liver oil or suggest its use, we should be sure to caution the parent to use the purest obtainable and to discourage the use of emulsions, extracts and the like. The emulsions and similar preparations are low in cod-liver oil content and we do not get the desired result through their use. The pure cod-liver oil is what we want, and it is none too good.

One more factor considered important by many authorities is proper observation and protection against thyroid disturbance in the mother during the prenatal and postnatal periods. This seems to be important, as I have noticed, in securing the histories of many of the children I have examined, that many mothers have had thyroid disturbance, usually thyroid enlargement, during the above mentioned periods. We are all aware of the important part the thyroid plays in general body metabolism, as well as its influence on calcium assimilation, and can thus understand the importance of preventing abnormal conditions developing in it. The administration of iodin to the mother is suggested as a routine treatment for protection.[5] This should be done only under the supervision of a physician, because sometimes it may be the active principle of the gland, thyroxin, which is needed instead of the iodin. A mistake either way may prove dangerous.

We now know the things that are important and that must be in the diet of the mother each day and in the diet of the child, as age permits. Being sure these four main groups, milk, leafy and green vegetables, fruits, whole grain bread and cereals are in the diet each day, we can then add to it the other things we like to eat, but in reasonable amounts; such foods as meats, pastries and the like. We have thus a diet which considers all nutritional requirements from the standpoint of minerals, vitamins, proteins, fats, carbohydrates and roughage.

I cannot omit some mention of the importance of breast feeding for the child. Every mother, unless conditions prevent, should be encouraged to nurse her baby as nearly the normal length of time as possible. This is the manner in which Nature intended the child should first receive its nutrition. A breast fed child has the greatest resistance to disease and tends to have stronger and better teeth. The exercise of the muscles of the face in the act of nursing helps to develop the bones of the face much better than those of

5. Mendenhall, R.: Preventive Feeding for Mothers and Infants, J. Home Economics, (October) 1924; Footnote 1, first reference.

artificially fed children who do not have to work much to get milk out of a bottle. If a child must be artificially fed, the mother should be encouraged to secure expert advice in the selection of the artificial feeding. The use of the highly advertised baby foods should be discouraged, because most of them are of high carbohydrate content and lack the materials that build strong bones and teeth. Some variation of cow's milk, dependent on the age of the child, seems to be the most commonly accepted substitute for the mother's milk. The use of clean, properly proportioned cow's milk should by all means be encouraged in preference to these highly advertised baby foods, if it becomes necessary to feed the child artificially.

In this connection, also, the mother should be cautioned not to nurse the child beyond the normal nursing period, about ten months, unless the physician advises it. For some time, it has been known that the iron content of mother's milk gradually decreased after about the eleventh month. About a year ago, investigators reported that the calcium and phosphorus content of the mother's milk tends to decrease from that time on,[6] probably owing to deficiency in the diet. What I was leading up to is this: I have seen many children who have been nursed sixteen, eighteen, twenty-four and several as long as thirty-six months before being weaned. In every instance, these children showed poor teeth.

There is one other dietetic danger or evil that should be brought to the attention of parents and that is the danger of an excessive use of sugar. In 1924, we used about $500,000,000 worth of sweets. The eating of candy and sugar is frequently the cause of children not having good appetites, and so failing to eat a sufficiency of the right foods. There is a local condition produced in the mouth also as a result of excessive use of sweets, which encourages decay of the teeth. Governmental statistics show us that, in every English speaking country, where we have an excessive use of sweets we also have the greatest amounts of tooth decay.

Just because we have looked after the nutritional angle as we should, do not let us sit back, content that everything is sure to be all right. We cannot liken the human body to a glass test tube. A chemist can place certain combinations of chemicals in a test tube and obtain certain results a thousand times a day for a thousand years, but you can't do that with the human body. One body will use and absorb foods as it should and another will not, so that, probably, one child in a family has good teeth and the other does not, though one child used the food as it should and the other did not. Now, there are certain things which tend to overthrow and destroy the intake of proper foodstuffs. I mentioned one of them when I told you about rickets and its corrective agents, cod-liver oil and sunshine. The various childhood diseases, such as scarlet fever, measles and whooping cough, all tend to show their bad effects. Health disturbances in the mother before the child is born, such as foci of infection and syphilis and other diseases that sap the vitality during the formative period of the tooth crowns, all surely play their harmful parts. Abnormal functioning of internal secreting glands, such as the thyroid, pituitary, parathyroid and so forth, may also upset

6. De Buys, L. R., and von Meysenberg, G.: The Calcium Content of Breast Milk in Relation to Rickets, Am. J. Dis. Child., 27: 438-443 (May) 1924.

the work of proper nutrition. I have in mind a case that I saw about a year ago, in a boy about 3½ years of age who had no teeth. Other evidences of slow development showed a thyroid involvement. Thyroid extract was administered, and, in six months, all the twenty deciduous teeth erupted.

Thus we have tried to sum up the various aspects of nutrition as they seem to affect the development of the teeth. We must now enter another field of the question, which has to do with the more direct care of the teeth for the purpose of maintaining them in a healthy condition. The child is beginning to get his first teeth and is about six months of age. We should instruct the mother as how to care for his mouth. The teeth should be kept clean from the time the deciduous central incisors erupt. Some prefer to use a cloth with a little boric acid solution on it and attempt to clean the teeth in this manner. I have found this to be more or less ineffective, especially with respect to the interproximal spaces. An efficient little brush for the small baby can be made by slightly shortening the bristles of an eye-brow brush and instructing the mother to use it carefully with a sweeping motion from the gums toward the biting edge of the teeth. Mothers should be cautioned to do this carefully and, especially if they use a cloth to cleanse the mouth, they should be warned not to exert any great pressure in the area of the soft palate where the styloid process is located. There are many cases on record wherein too much pressure on the area just opposite the point where the second deciduous molar erupts and about where the hard and soft palates join causes the little sharp point of the styloid process to be forced through the flesh and a slight wound is the result. If this were to occur several days in succession, a severe irritation could be set up, which would eventually result in a severe ulceration of the area.

The mother should be told that the teeth should be cleaned at least twice a day, especially emphasizing the importance of having the child's mouth clean when it is put to sleep at night. At least up to 6 years of age, the mother or father or some adult should supervise the night brushing to be sure that it is thoroughly done. Many mothers have difficulty in controlling the child while they are attempting to brush the teeth. If the mother will stand behind the child, permitting the child's head to rest against her, having the head tipped slightly back, using the left forefinger to raise the child's upper lip, or to pull the cheek away from the buccal surfaces of the teeth, and using the left thumb to press the lower lip away, she thus has easy access to the buccal surfaces of the teeth on the left side of the mouth and to the labial surfaces of all the anterior teeth. Now, for the buccal surfaces of the teeth on the right side, she must stand a little to the right and slightly in front of the child, and, again with the left forefinger, she can pull the cheeks away and gain easy access with the brush. For the lingual surfaces of all teeth, the posterior position is again assumed, the head being tilted a little farther back than for the left buccal and labial cleansing. The child is instructed to open the mouth fairly wide, and from the posterior position, the mother now has direct, easy access to the lingual surfaces of all the teeth. She may have to move the child's head slightly from one side to the other as the surfaces of the left or right teeth are brushed, but that is the only change

from this position. Such instructions to the mothers are essential, as I have observed in my several thousand contacts with parents in the last year or so.

Parents should also be instructed and cautioned about the deforming effects on jaws and face of the various habits, thumb, finger, lip and tongue, mouth breathing, sleeping posture and all postures that tend to cause abnormal pressure on the bones of the face. They should be taught how to overcome these various habits, if they should appear. Many parents do not know even how to overcome the thumb-sucking habit. One thing is sure: the earlier the habits can be discovered and stopped, the easier will be the cure and the less the damage done. But if a parent attempts to stop a habit, she or he should carry the campaign on to a successful conclusion, in spite of opposition on the part of friends, adoring grandparents and neighbors. The child may cry and create a disturbance for a few nights, but that is nothing compared to their woe and chagrin in later life when they realize the deformity to face and teeth as a result of parental neglect. I regret that much of this neglect is due to the fact that the dentist or the family physician did not give necessary and emphatic instructions to the parent.

The mother finally comes to the family dentist with the child, desiring dental attention. What are the proper procedures for the dentist? First of all, he must take enough time to gain the confidence of the child. He may find it advisable to have the child come to the office several times before he attempts any operative work. Do not lie to a child or permit a parent to lie to him. If an operation is going to hurt, tell the child the truth. Broken confidence is very difficult to overcome in a child, especially if it concerns pain. In most cases, it is well to keep the child informed as to what you are doing. It keeps his interest away from the hurt, and he eventually feels that he is taking an active part in each step of the operation. A successful child specialist has been able to do much with children by using the "grab-basket idea." She has purchased many little cheap toys and trinkets attractive to children and placed them in a basket. As a reward for being good during each visit, the child is permitted to reach into the basket and take out one article that appeals to it. This has proved a great aid in the handling of her child patients. There are many other little tricks that you all know of which can be used. The dentist should not fail to consider that his child patients must be handled much more carefully, with much more ingenuity and patience, than he uses in his adult patients.

Once we are able to proceed, we should make a thorough examination. Look carefully for proximal and occlusal decay, using a fine explorer. If any suspicious areas are found, they should be treated at once. Evidences of malocclusion should be noted, and the parent should be instructed to have them cared for as soon as possible. This work should not be delayed any longer than is absolutely necessary. We see too many cases of malocclusion in which treatment is delayed or discouraged because the family dentist does not do that kind of work and thinks it might lower him in the eyes of his patient if he admits it.

Parents appreciate honesty in regard to their children's teeth, and if the dentist will refer these orthodontia cases to someone who does that kind of work, and insist that it be done early, he will

surely receive nothing but gratitude in return. Many cases might appear, at first glance, as hopeless possibilities for orthodontic treatment from a financial standpoint; but it is surprising how quickly many parents are able to finance the treatment when they fully understand what it is going to mean to the child.

My experience with many children and dentists convinces me that many of the latter do not know how to do certain reparative or preventive work on children's teeth or that they do not want to do it. I just want to brighten the memory of these men and set before them again some very reliable methods of procedure and materials used in this kind of work.

In regard to cavity preparation and care of children's teeth, I would ask all dentists to read G. V. Black on cavity preparation, and his chapter on management of children's teeth[7] in Operative Dentistry. I also recommend Dr. Evangeline Jordon's book on the care of children's teeth. I especially recommend Dr. Black's suggestion of the use of Arthur's method on the anterior teeth along with the use of silver nitrate and oil of cloves for the treatment of decay in the anterior teeth of children, especially when it is impossible to so prepare the cavity that it will retain a filling. If dentists could only realize what an important and helpful drug combination silver nitrate and oil of cloves offer, they could save thousands of teeth that are now being lost long before their time. It is also a helpful remedy in posterior tooth decay. My experience has been that the silver nitrate without the oil of cloves is not nearly so effective. Especially is oil of cloves indicated in areas of decay closely approaching the nerve. It should be used prior to the introduction of the silver nitrate. The use of oil of cloves tends to lessen to a large extent the pain that results from application of silver nitrate first. It is generally necessary to apply the silver nitrate and oil of cloves treatment several times a year. Especially is frequent application necessary when the child's mouth shows early, extensive and rapid decay. Cases of this character demand at least four applications of silver nitrate and oil of cloves a year, or new decay soon makes its appearance. The liberal use of silver nitrate and oil of cloves or of Howe's solution in the pits of fissures of deciduous and permanent molars, immediately after they erupt, is a big factor in keeping these teeth healthy. The use of a thin mixture of black copper cement forced or worked into these pits and fissures after they have been treated with silver nitrate and oil of cloves is a further protection. I cannot stress the value of silver nitrate and oil of cloves too much.

Wherever possible, especially on the posterior teeth, amalgams are always to be preferred to cements. The cements must be used in many instances. Too many dentists use only cements for children's work and this probably has much to do with discouraging results obtained. Most children I have seen who have had good amalgam fillings placed in the deciduous molars have had to make fewer return trips to the family dentist for repair and show fewer teeth that have reached the "beyond repair" stage because of recurrent decay. We must, of course, always choose the filling materials best suited to the case in hand.

7. Black, G. V.: Operative Dentistry, Vol. 1, p. 235.

Possibly all these remarks about technic and materials seem unnecessary. But my work brings me in contact with many children, parents and dentists, and I have had many confessions of neglect in this kind of work from dentists themselves. Week after week, I am sorry to say, mothers, with tears in their eyes, tell me they have taken their child or children to the family dentist, and have not been told any of the things mentioned in this paper. They have been told that the child's teeth would soon be replaced with others, that they were only temporary teeth, and that they were not worth the expenditure of time and money.

Right here I desire to call attention to the retention or badly broken down and abscessed deciduous teeth. The excuse for this practice is that the retention of such teeth is necessary for the maintenance of space to permit the regular eruption of the permanent teeth. Possibly, a few, and I would say a very few of these teeth, serve such a purpose successfully. Their contacts are all destroyed, and when that is lost, surely they do little good in retention of space. It seems to me that, in cases of this character, we have one of two courses to select: retention of badly broken down and abscessed deciduous teeth for the possible space retaining value they may have, and this at a possible sacrifice of the health of the child; or the removal of such teeth, running the risk of a malocclusion but being assured we have not endangered the health of the patient. There is said to be a difference between a clean mouth and a dirty mouth which is the difference between 10,000,000 bacteria as found in a clean mouth and 500,000,000 bacteria as found in an unhealthy mouth. It is foolish to argue that a child is not so susceptible to bacterial invasion as the adult. Then too, a malocclusion is much easier to correct than a heart, kidney or nervous involvement. We also can prevent many of these malocclusions in such cases if we will but use space retaining appliances in the areas, when we are forced, because of disease, to remove deciduous teeth before their time. In all my clinic work, I have seen but three mouths in which space retainers were used. I say it is time that we look with careful judgment at this unnecessary retention of badly diseased deciduous teeth.

I see as I review the many child mouths that I have examined much work poorly done, poor judgment in filling materials used and carelessness evidenced in the placing of those fillings. There is frequently evidence of failure to care for all trouble found; failure to make careful examinations and discover all areas that need attention, and so on down the list of neglect. Statistics I have gathered so far show that only about 3 per cent of all preschool children in Iowa are receiving dental attention, and that sixty-one out of every hundred we see are in need of attention. I see many children under 1 year of age in need of dental care. I beg to differ with those who suggest that 3 years of age is the time to start dental care for children. In many cases, by that age, it is too late. We have at least the responsibility as regards these little patients that we have with our adult patients. With such a small percentage of them, as above noted, coming to us for attention, surely we can at least treat them fairly. These children will all grow and develop, we hope, into citizens strong and healthy in mind and body. A clean, healthy mouth, it is needless to say, will have

much to do with the development of that normal mind and body. We, as dentists, are the only ones qualified and trained to make the mouth healthy and keep it that way. Would we permit a son or daughter to carry in the mouth, day after day, decayed, diseased, painful teeth and make no effort to eradicate the condition? Whatever we do, let us be honest with the parent and the child. If we do not want to work for children, let us at least not cover it up at a sacrifice to the child. Refer the parent to someone who will do this kind of work; better still, try to learn to like it, and each of us shoulder our own burden in this work for children.

True it is, there is much grief, irritation, loss of time and small financial return for this kind of work. We should arrange our appointments for the child patient at a time of the day when we and our patients are the freshest and most able to face the strain relative to this class of work. The remedy to the drawbacks, financial and otherwise, in this field, is largely in our own hands. Let us start in now and educate our patients in the things they should know, get our child patients to the dental offices at an early age and often for examination and care. Let us do our work well and at once, wherever needed, and make good use of all things at our command to keep the child mouth healthy from the standpoint of diet and corrective treatment. Let us educate the parents to the importance of caring for the deciduous teeth. Try to eliminate "temporary" and "permanent" from our vocabulary as far as teeth are concerned. Talk teeth from the standpoint of health, whether of the first or second set, and talk it at every opportunity. The result: Our fees and dislikes for the work must adjust themselves, and we can some day lay down the working tools of our profession, knowing that we gave the best we could unto the least, the youngest of our patients.

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INDUSTRIAL DENTISTRY FROM THE EXECUTIVE'S POINT OF VIEW

By R. I. HUMPHREY, D.D.S., Chicago, Illinois

THOSE who are not familiar with group dental service sometimes ask why manufacturers should enter the field of medicine or dentistry when their main object is along the line of production and sales, and not in the field of health conservation. Most industrial executives realize that there is a definite relationship between a man's health and his ability to produce. Then, too, many executives have had personal experience with dental disorders, and in that way know that there is a great deal to be gained by keeping one's mouth in first class condition. They also realize that there are not enough dentists to care properly for the vast number of people in need of dental service, and that if all employes are to receive their share of available dental service, some special method must be adopted to attain that end. It is also

well known that a majority of our industrial population do not appreciate the importance of having first-class dental service, or, for that matter, any dental service at all, except for the relief of pain.

With a thorough knowledge of the existing condition, the next questions are: What can we do in the way of dental service that will be of the greatest value to the men and the company? Should we limit our activities to examination and advice, or should we go a little farther and do certain types of dental work, or is it advisable to render a complete dental service?

Conditions in different localities and in different industries have considerable bearing on these questions, but, in a general way, executives are agreed that the most important function that the dental department can perform is taking care of emergency cases, and eliminating infections in the mouth that are causing disability or that may be a source of trouble at some future time. Most executives are not interested in the esthetic field of dentistry. In other words, a man may have several missing teeth and still not be disabled or suffer any physical discomfort, provided there are enough teeth in the mouth to masticate his food properly.

Generally speaking, any service rendered by the dentist that will eliminate or prevent dental infection helps both the employe and the employer. There has been a great deal of agitation among some dentists engaged in industrial work regarding the use of a uniform statistical chart so that we might be able to prove with figures that dentistry in industry is a paying proposition. However, most manufacturers are not interested in statistics of this nature except in a limited and concrete way. They are not willing to hire a force of clerks usually necessary to compile such data. It is not difficult to prove that dentistry is a paying proposition in a plant, provided the scope of work is of the right sort and the relationship of the dentist to the employe is of the same order as it would be if the employe were presenting himself to the dentist's private office for treatment. This brings us to the question of dental personnel in a plant.

I know of several instances in which one dentist in a plant was a complete failure, and another at the same plant was a great success. The reason, of course, was that the attitude of the first dentist toward the whole dental program was repellent. He lacked the proper balance and was not generally interested in the industrial dental field except as a temporary proposition. He expected to accumulate a few dollars and move into private practice and did not care much what became of the factory's dental office after he was gone. In other words, he was tearing down rather than building up the proper human relationship which must always predominate in handling work of this character. The executive at this plant informed me that unless a more congenial operator was provided, it would be necessary to discontinue the dental service at his plant altogether. Naturally, an immediate change was made, and, after a period of six years, dentistry at this plant is regarded as a highly desirable part of the general manufacturing program.

I know of instances in which dentists in charge of corporation work became so enthusiastic about the work that they induced executives to go into the field on an extensive scale, and, consequently, a large dental personnel was built up, out

of proportion to the general manufacturing program. Experience in industrial activity indicates a tendency for the head of each department to build just as large an organization as the executive will permit, the head of the department thinking, of course, that the more people he has under his supervision, the greater will be his responsibility, and usually his income.

This sort of thing is to be discouraged in the dental department, just as it should be discouraged in any other department. It is unfortunate for a department of this kind to become top heavy, because the reaction is usually severe and sometimes disastrous. It is better, then, to grow with the organization and keep in mind that there is a limit to what can be accomplished and should be attempted in an industrial dental clinic. Some men interested in industrial dental work have advocated the formation of neighborhood or group clinics located at more or less distant points and supported by the various manufacturers in the neighborhood. From the executive point of view, any activity that concerns the disbursement of the corporation's funds should be governed by the same rules and regulated as if it were an integral part of the manufacturing program. Therefore, it is not only desirable but also necessary that the dental office be located on the company's property and be subject to the same rules and regulations as any other department.

The question as to whether or not the man in the office or the man in the shop should be given preference by the dental department sometimes arises. The man in the shop is generally in greater need of dental service and less favorably situated in the matter of receiving treatment. It, therefore, seems logical that this field should be given preference in all cases.

Summing up the whole situation as it affects the executive, he is interested in any activity that will improve the health and efficiency of his employes and will create a better spirit of cooperation and good will throughout his industrial family. There are many executives today who realize and appreciate the part that the plant dentist can play in this important field of helping to maintain the most important and expensive machinery in the plant, namely, the employe.

CONGRESS EXHIBIT OF THE DEPARTMENT OF DENTAL HEALTH EDUCATION

The department of Dental Health Education of the American Dental Association presented an exhibit at the Health Exhibit of the Seventh International Dental Congress.

The central unit was the exhibit developed by the Department at the request of the Smithsonian Institution, Washington, D. C. This is now part of the permanent exhibit at Health Hall, Smithsonian Institution. The exhibit has for a central idea the slogan, "Watch your teeth," emphasized by a lighthouse whose light flashes on and off periodically, in order that "he who runs may read." Four sections, two on either side, stress the tooth-building foods and foods requiring mastication, the importance of deciduous teeth, and the necessity of proper daily care and of regular visits to the dentist.

Other features of the Congress exhibit were a bookcase containing books on personal and public health, maternal, infant and child hygiene, mental hygiene, health teaching, dental hygiene and nutrition. A

complete list of the book, any of which may be borrowed by any member of the American Dental Association for two weeks, can be obtained from the Department of Dental Health Education.

On a table were "Helpful, Healthful Hints for Your Waiting Room." Included were health books for children and adults, a health scrap book, a health puzzle, magazines on health, and flyers entitled "To Mothers," "To Boys," "To Girls," "Caring for Teeth,"

HEALTH FLYERS

A series of flyers for offices or clinics have just been completed. They are as follows:

To Mothers.
To Boys.
To Girls.
The First Permanent Molar.
Foods and Teeth.
Caring for Teeth.

Prices: To 100, 1c each; more than 100, ½c each.

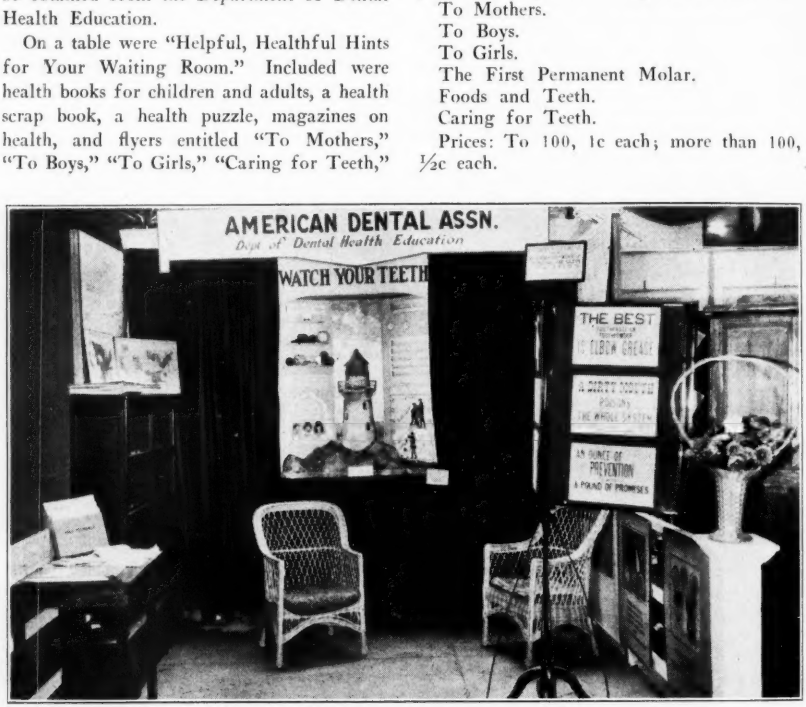

Exhibit of the Department of Dental Health Education, at the Seventh International Dental Congress, at Philadelphia, Aug. 23-27, 1926.

"The First Permanent Molars" and "Foods and Teeth." Samples of the flyers will be sent on request.

Samples of the educational material available on request to the Department of Dental Health Education were displayed on an easel.

Maps showed the proportion of population to dentists and physicians in the various states; the location of dental schools; the states licensing the dental hygienist, the location of the training schools, and the states having full-time dental workers, or dentists as members of or consultants to the state board of health or of education.

FIELD NOTES*

The Commonwealth Fund, which is putting on a child welfare program in Salem, Oregon, is working with the Oregon State Board of Dental Examiners in providing a fund for a dental program in Salem. Dr. E. L. Brunk, of Salem, has charge of this program. Before outlining his plans, he studied various dental programs and visited, among other places, Fargo, N. D., Minneapolis, Lansing and Saginaw, Mich., Cleve-

*The Department of Dental Health Education will be glad to receive items of news along the lines of education in dental or general health.

land, Ohio, Rochester, and New York City, Boston and Pennsylvania. It is hoped that, as an outgrowth of this demonstration, a state-wide program will be developed.

The Province of Ontario had a dental health day, October 20. Newspaper articles, exhibits, lectures, motion pictures and slides were used to spread the message of dental health. A free dental examination was given to anyone who requested it. The plans were under the direction of Dr. Fred J. Conboy, director of dental services for Ontario.

Miss Helen M. Baukin, supervising dental hygienist, Department of Public Instruction, Honolulu, writes that there was a reopening of the dental hygiene school in September. This is conducted in connection with the Territorial Normal School and is a two-year course. As this is the first school of dental hygiene to be established in connection with the teacher's training college, the results will be watched with keenest interest.

The Chicago Lying-In Hospital is to open a dental clinic for expectant mothers at its dispensary.

Mansfield, Ohio, had a special program on "May Day—Child Health Day." Children who had no physical defects or had had them corrected were awarded blue ribbons. There was a parade of blue ribbon children; motion pictures were shown in the various schools, and window displays were worked out by grocers, druggists and fruit dealers. In short, health was emphasized in every possible way. In order to join the "blue ribbon class," many children had their teeth cleaned, extracted or filled so that the general mouth hygiene standard was raised by "Child Health Day."

The District of Columbia Dental Health Society observed the first dental health week for Washington. The district commissioner issued a proclamation to this effect and the movement was endorsed by the health department. Members of the Dental society enlisted the cooperation of the clergy, state railway companies, civic organizations, schools and merchants.

Delightful posters, made by the art department of the high school, were displayed throughout Huntington County, Ind., as part of the dental health week program, sponsored by the Indiana State Dental Society.

When the Louisiana Dental Society met at New Orleans, it was recommended that the type of dental service now in operation in Shreveport and in the rural districts in Caddo Parish be extended to cover the rest of the state. The plan includes the use of a motor car, equipped as a traveling dental office, in which a dentist travels through each parish, examining the teeth of the children, advising about treatment and doing corrective work for the indigent. The salaries of the dentists working in the parishes at present are paid by the bureau of child hygiene of the state department of health. The maintenance of the operators, as well as the supplies, are paid for by the county in which the clinic is operating.

The parent-teacher association of Riverside, Calif., devoted its last meeting to a study of the dental problem. Three local dentists presented various aspects: the effect of diet on the development of the teeth; the importance of the deciduous teeth; malocclusion, and the effects of abscessed teeth.

Porto Rican dentists are alive to their community responsibility. They have a committee on mouth hygiene and public instruction, are publishing articles on dental health in the Sunday papers, are fostering the development of industrial dental clinics and have conducted an essay contest among the high school students of the Island. The members of the dental society have given many health talks in the schools and before groups of parents, and also radio talks and lectures with lantern slides before civic groups.

Medical and Dental News

ARKANSAS

Dr. Feazell Retires After Long Service: Dr. W. T. Feazell, of Sulphur Springs, recently retired from the practice of dentistry after more than fifty-five years' continuous service. He began practice in Carthage, Mo., in 1871, shortly after his graduation from the St. Louis Dental School.

GEORGIA

Dr. Franklin Elected as Representative: R. A. Franklin was recently elected state representative from Butts County.

ILLINOIS

Eastern Illinois Society Meets: The Eastern Illinois Dental Society met in a two-day session, September 17-18, at Charleston. Officers elected were as follows: president, C. E. Bellchamber of Effingham; vice president, S. T. Butler, Sullivan; secretary, Donald M. Butler, Sullivan; treasurer, G. M. Trafton, Chrisman. The 1927 meeting will be held at Mattoon.

Northwestern Dental School Opens to Students: Although the building operations are still going on, students attended their first classes in the new building on McKinlock campus which houses the dental and medical schools of Northwestern University, Chicago, October 7. Founders' day was celebrated, October 6.

Results of Examinations of Dentists: Seventy-nine dentists were given a thorough examination through the efforts of the lay education committees of the Illinois state dental and medical societies at the Illinois State Dental Society meeting in Springfield last May, the work being conducted by eighteen physicians and two laboratory men. Thirteen were found to need glasses and there were eighteen others requiring the attention of the ophthalmologist for minor irregularities and pathologic conditions. In nine, the heart was affected; in one, the lungs were diseased, and twelve showed some irregularity in the condition of the kidneys. Ten were overweight; twenty-two, underweight. In five, the blood pressure was high, in twenty-two, low. There were neurologic deviations in thirteen. Exclusive of roentgen-ray findings, there were twenty-two dental conditions needing attention. General inspection revealed forty-nine variations from the normal, such as flat feet, spinal curvature and gall bladder disease.

IOWA

Dr. Hasek on Hospital Staff: Dr. Vaclav Hasek has been elected chairman of the staff of the Mercy Hospital at Cedar Rapids.

Sioux City Society Elects Officers: At a recent meeting, the following were elected officers of the Sioux City Dental Society for the ensuing year: president, C. E. Westwood; vice president, W. H. Kenderdine; secretary-treasurer, Mort Henkin.

MINNESOTA

Settlement House Opens Clinic: The Wells Memorial settlement house, Minneapolis, opened a dental clinic recently, covering a territory untouched by other clinics, after a survey that indicated that there was a great need for dental care among children of preschool age. S. B. Beugen is in charge. This is the fourth clinic to be opened by Minneapolis settlement houses.

NORTH CAROLINA

Durham-Orange Counties Society Elects Officers: At a meeting held to plan activities for the next twelve months, at Durham, the following were elected officers of the Durham-Orange Counties' Dental Society for the coming year: president, R. H. Holden, Durham; vice president, Benjamin D. Mann, Jr.; secretary-treasurer, N. T. Holland, Smithfield.

NORTH DAKOTA

New Officers for Central North Dakota: The Central North Dakota Dental Association recently elected the following officers for the ensuing year: president, H. E. Thomas, Ellendale; vice president, Larry B. McLain, Jamestown; secretary-treasurer, L. C. Anderson, Jamestown.

NEW YORK

Dental Department at Poughkeepsie Opened: The newly equipped dental room at Vassar Brothers' Hospital, Poughkeepsie, was opened recently. Apparatus was contributed by J. O. Schoonmaker and funds for buying instruments were donated anonymously. Consulting dentists on the staff are Stephan Palmer and J. E. Patterson of Poughkeepsie, H. S. Dunning and Douglas Parker of New York City. The attending dentists are Drs. Schoonmaker, Coulter, Baker and Stevens, assisted by Drs. Lawrence, Cary, Bryne and Stein.

Ninth District Society Meets: The Ninth District Dental Society met, October 9, at Newburgh. Russell W. Tench, of New York, presented a paper on "Important Points of Technic for Taking Impressions for Full Dentures; Registering Central Occlusion." Charles M. McNeely, of Brooklyn, spoke on "Remounting—Balancing Occlusion—Relation Between Balanced Occlusion and Areas of Irritation—Instructions to Patients." The officers of the society are: president, R. L. Clark, Mount Vernon; president-elect, H. S. DeWitt, Middletown; secretary-treasurer, F. A. Squires, White Plains.

PENNSYLVANIA

Medal Awarded to Dr. Coolidge: The Franklin Institute of Philadelphia has awarded the Howard N. Potts gold medal for 1926 to William D. Coolidge, Ph.D., inventor of the roentgen-ray tube which bears his name, and now assistant director, research laboratory, General Electric Company. The medal will be awarded October 20, by the institute, "in consideration of the originality and ingenuity shown in the development of a vacuum tube that has simplified and revolutionized the production of x-rays." Dr. Coolidge will then present a paper on his new cathode ray tube.—*J.A.M.A.*, Aug. 7, 1926.

WISCONSIN

New A. D. A. President Honored: Henry L. Banzhaf, recently elected President of the American Dental Association, was honored at a banquet, October 5, given by the Milwaukee Odontological Society, at the University Club. Among the speakers of the evening were Otto G. Krause, president of the Society, Charles W. Hall, William Hopkinson, T. A. Hardgrove, E. A. Geilfuss, Hart J. Goslee and Otto U. King.

NAVY

Navy Dental Corps: Officers of the Navy dental corps have been directed to change stations and duties as follows: Lieut. Comdr. P. G. White from naval hospital at Norfolk to U. S. S. Pittsburgh; Lieut. Comdr. C. T. Lynes from marine barracks, Parris Island, S. C., to U. S. S. Florida; Lieut. Comdr. DeW. C. Emerson from U. S. S. Melville to naval hospital at New York; Lieut. G. L. Reilly from Philadelphia navy yard to U. S. S. Shawmut; Lieut. J. L. McCarthy from U. S. S. Shawmut to Naval Academy; Lieut. E. L. Walter from U. S. S. Wyoming to U. S. S. Mercy; Lieut. P. H. McInnis from U. S. S. Utah to navy yard, Portsmouth, N. H.; Lieut. J. M. Billings from naval medical school at Washington to marine barracks, Parris Island, S. C., and Lieut. F. A. Richison from Naval Academy to U. S. S. Altair.—*Army-Navy Register*, Aug. 21, 1926.

ARMY

Dental Corps: 1st Lieut. E. F. Arnold, granted 1 month, 23 days' leave, effective August 30.—Aug. 28, 1926.

Capt. C. J. Denholn, relieved Fort Totten, upon arrival Capt. C. H. Glascock; assigned to Fort Omaha.

Orders assigning Capt. C. H. Glascock to Fort Omaha amended so as to assign him to Fort Totten.—Sept. 4, 1926.

Maj. W. S. Smith, proceed home and await retirement.—Sept. 11, 1926.

Capt. Dell S. Gray, relieved Selfridge Field, assigned Fort Wayne.

Maj. J. G. Morningstar, relieved general dispensary, Washington, D. C., assigned Philippine Dept., sailing from New York on Dec. 22.

Maj. O. P. Snyder, assigned Fort Bliss, Texas, effective upon completion tour of foreign service.—Sept. 18, 1926.

Lieut. Col. R. E. Ingalls, ordered to Walter Reed Hospital for treatment.

Resignation of Maj. H. M. Tarpley is accepted, effective Oct. 7.—Sept. 28, 1926.

FOREIGN

New Dental School, New Zealand: The new dental school buildings of Otago University, Dunedin, New Zealand, were officially opened, June 11. The school and equipment cost about $200,000, practically all of which was contributed by the government. Several private donations were made toward the equipment. The school was founded as a result of the efforts of the New Zealand Dental Association and public spirited citizens. Prof. H. P. Pickerell is the dean of the dental faculty.

Extension of Guy's Hospital Dental School: The new extension of the Dental School of Guy's Hospital was opened July 8. The cost of the extension was $110,000, including the equipment and fittings, and was contributed by the Dental Board and Dental School.

Prize Essays: The directors of the *Medical Journal of South Africa* offer prizes for the best three essays submitted on or before December 31 on one of the three following subjects: (a) Dental caries in native children in kraals or in urban areas. (b) Frequency of infestation with and pathologic conditions due to intestinal parasites among Europeans or natives and the treatment. (c) Surgical tuberculosis in South Africa and its treatment. (d) Etiology and pathology of chronic diarrhea, with especial reference to South Africa. The competition is open to native medical students or medical practitioners, even though they may temporarily reside outside South Africa. Two or more persons may collaborate in writing an essay. The prizes will be 100, 60 and 40 guineas, respectively.—*J.A.M.A.*, Aug. 14, 1926.

Oral Hygiene in the Phillipines: Dental clinics, under the Junior Red Cross, began operations the first week of the school year. In some, all teachers are required to have a dental examination. The *Red Cross Courier* says: "Oral hygiene in the Phillipine Islands is writing itself large in the physical advancement of the people."

DEATHS

Bedell, R. H., Urbana, Ohio; University of Michigan College of Dental Surgery, 1900; died of heart failure, September 18; aged 49.

Bushnell, A. D., Chicago, Ill.; Northwestern University Dental School, 1897; died September 10.

Cook, W. J., McKeesport, Pa.; Detroit College of Medicine, Department of Dental Surgery, 1909; committed suicide, August 23, after a nervous breakdown, attendant on several months' illness; aged 50.

Cooper, Gustavus A., Brooklyn, N. Y.; died, September 16; aged 73. Dr. Cooper had retired from the practice of dentistry.

Dawson, W. T., Chicago, Ill.; Northwestern University Dental School, 1909; died September 4.

Haden, Joel W., Otter River, Va.; died August 22; aged 86. Dr. Haden was a Confederate veteran.

Hussey, J. E., Osgood, Ind.; Central College of Dentistry, Indianapolis, 1903; died, June 19, of blood poisoning; aged 46.

Love, George, Scio, Ohio; Ohio College of Dental Surgery, Dental Department of the University of Cincinnati, 1892; died, a suicide, after a long period of ill health, August 13; aged 73.

Marling, A. J., Greenville, Ohio; died, August 29; aged 56. Dr. Marling practiced dentistry for forty-five years.

Neall, W. H., Philadelphia, Pa.; Pennsylvania College of Dental Surgery, 1880; died, September 15; aged 64.

Osmun, J. C., Scotch Plains, N. J.; died, September 11; aged 77.

Pierrepont, J. H., Trenton, N. J.; Pennsylvania College of Dental Surgery, 1876; died of apoplexy, August 29; aged 72.

Probst, John G., Milwaukee, Wis.; Northwestern University Dental School, 1900; died, August 23, from pneumonia; aged 46.

Scheid, John E., Philadelphia, Pa.; Temple University School of Dentistry, 1911; died August 24; aged 55.

Wheeler, C. W. B., Westport, Conn.; The Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, 1900; died of apoplexy, August 19; aged 52.

Witherson, R. B., Irwin, Pa.; University of Pittsburgh School of Dentistry, 1920; died recently, after an operation for appendicitis; aged 28.

CURRENT LITERATURE

EXTRACTS AND ABSTRACTS

Radon (Radium Emanation) as a Palliative Agent in the Treatment of Intra-Oral Cancer: In intra-oral cancer, distinctly operable lesions may be excised and inoperable should be irradiated, according to the observations of Simpson and Flesher (*J.A.M.A.*, Aug. 28, 1926). Opinions of others differ as to which cases are operable and which inoperable, some declaring that surgery has no place in the treatment of the primary lesion, others that only hopelessly advanced cases should receive irradiation. The advantages of radon over radium, according to the authors, are: 1. A large dose can be concentrated over a small lesion. This is of importance in shortening the time of exposure. 2. Bare glass tubes containing radon may be introduced directly into tumor tissue, a procedure that is necessary to success in such cases as cancer of the tongue. 3. If a radon tube is lost, it is not a calamity, as it has little or no intrinsic value. Those who use large quantities daily are protected from local and constitutional effects by handling the radon tubes with rubber covered forceps 12 inches long and by intervening lead plates while application is in progress. The lymphatic glands are treated by means of blocks of soft wood through which the radon permeates. In fifty-six unselected cases of intra-oral squamous cell cancer, the ages of patients ranging from 29 to 71 and duration of disease from one month to three years, the site of the lesion was as follows: tongue, nine cases; floor of mouth, three; buccal mucous membrane, seventeen; superior maxilla, eight; inferior maxilla, seven, and palate and tonsil, twelve. In twenty-nine cases, there was lymphatic involvement. Seventeen patients were lost sight of. If it is assumed that they are dead, the mortality in these cases is thirty-six, or 63.3 per cent. Twenty patients, or 35.7 per cent, have been well for periods of three to five years.

Where Are We Going in Oral Hygiene?: It has been two decades or more since we, as a nation, rediscovered our teeth. At about that time striking instances were brought to light in which localized or systemic infections of serious character were traced to abscesses or pyorrheal conditions in the mouth. The cumulative evidence of this character from several sources indicated a serious problem and the need for serious preventive measures. With characteristic American energy we rushed off with hue and cry after a dental program. What kind of a dental program? That apparently was of minor importance; the main thing was that it should be a dental program. The confusion of thought and lack of a sense of relative values that has been behind this popular wave of enthusiasm has been evident in much that has been said and written in behalf of oral hygiene. There has been a marked tendency to lump together a variety of bad oral conditions such as unclean teeth, irregular grinding surfaces, malocclusion, caries of the dentine, pyorrhea and abscessed roots, as all of equal importance. From some of the literature on the subject one might judge that any or all of these conditions might cause arthritis, pyelitis or endocarditis. In fact, a prominent school superintendent has made such public claims for the results of an oral hygiene program in eliminating retardation and delinquency and building up physique as would appear to justify the elimination of nearly all other types of health work. Even as recently as 1919, in the book of a leading authority on schools, the flat statement was made that a tooth that is "kept clean cannot decay." Fortunately, there is an effort on the part of conscientious leaders in the dental field, and in other fields, to secure scientifically reliable evidence as to causes and effects and relative values in preventive dentistry.—*Am. J. Pub. Health*, September, 1926.

Dental Disease in Children: In an investigation conducted by the Medical Research Council on the incidence of dental disease

in English children (*J.A.M.A.*, July 31, 1926), arrested caries was found in only forty among 6,753 permanent teeth. Arrest of caries is more than six times as common in deciduous as in permanent teeth. In permanent teeth, it is recorded only in molars and bicuspids. Occlusal cavities are by far the most common site for its occurrence, and in most instances the caries is of the third degree of severity. This implies a considerable loss of enamel from the occlusal surface. These facts point to accessibility of the cavity as an important factor in the arrest of caries. It was noticeable that when arrested caries occurred mesially or distally in deciduous teeth, it was nearly always associated with wide spacing due to the growth of bone; this occasioned greatly increased accessibility. Another point bearing on the greater frequency of arrested caries in deciduous than in permanent teeth is the rapid wearing down of the occlusal surface of the former. This tends to make cavities shallower and to smooth off overhanging edges of enamel. An attempt was made to investigate the incidence of caries as it occurred in schools in different parts of the country. It was found that caries was more frequent in town than in country schools. The question of hard and soft water supply was also investigated. It was not found possible to ascribe any etiologic significance to the character of the water.

Chocolate and Caries: In an article entitled "Does the Use of Chocolate Tend to the Increase of Dental Caries?" Eckstrom, of Goteborg, points to the fact that chocolate foods are by no means so harmless to the dentition as is so generally supposed, because, on account of chocolate's very glutinous property, it adheres everywhere, round, on and between the teeth. Eckstrom refers to the researches of Dr. Pickerill, from which the fact stands out that of all substances which are capable of forming acids under the influence of the oral conditions, chocolate stands preeminent, far surpassing even cane sugar itself. Now, as the formation of acids, especially lactic acid, is of special significance in the origin of caries, the author recommends that no chocolate be given, especially to children, and that it should be replaced by fruit, principally apples. The decrease of dental caries in Sweden during the war, the author believes to be closely connected with the disappearance of chocolate from the market at that time.—*New Zealand Dent. J.*, July, 1926.

Noneruption of a Second Deciduous Molar: An interesting example of a rare condition, that of noneruption of a deciduous molar, is recorded by J. Chrompret in the *Revue de Stomatologie* for July, 1925. A girl, aged 8½, had a gap in the right upper second deciduous molar region. The first deciduous molar was still present, and the first permanent molar was inclined forwards and encroaching on the space. There was no history of extraction of the tooth, and the parents were positive that it had never erupted. A radiograph showed that the second deciduous molar was present in the alveolus, and that above it there was the second premolar in its crypt. Under a local anesthetic the second deciduous molar was removed. Normal absorption of the roots was present. Failure of eruption of a tooth of the deciduous series is sufficiently rare to be worth recording. Of the various abnormalities of the deciduous dentition, so much more frequent than was formerly supposed, failure of eruption is undoubtedly the least common condition.—*Brit. Dent. J.*, Aug. 16, 1926.

Dental Diseases and General Health: No recent contribution has done more to dignify the position of the dentist, or to increase his responsibility, than the theory of focal infection. However grateful he may be for the former, the added burden of this increased responsibility for health conditions remote from the mouth is not a welcome one. But if the validity of this theory is accepted to any degree at all, he must accept this added burden with all its consequences, or give up the practice of his profession. One would neither care nor dare to refute this hypothesis of focal infection in toto. To the men and women who are practicing the healing art, it offers so promising a resource both in diagnosis and treatment, that to give it up entirely would handicap their therapeutic procedures to a very noteworthy degree. In the second place, so much evidence favourable to its acceptance has been accumulated in the last decade that it is hard to conceive of a person rash enough to deny this hypothesis completely. At least such an individual must be classed with those who refuse to accept the statement that the earth is round and revolves about the sun, or with

those who do not believe in the theory of evolution.—E. L. Hatton, in *Oral Health*, July, 1926.

Cancer of the Lip: Butler (*An. Fac. de Med.*, December, 1925) analyzes 173 cases of cancer of the lip and eighteen of precancer conditions. In the 159 cases involving the lower lip, seventy-seven were smokers and fifty-one *maté* users. The total 191 cases included 8.8 per cent women; in 23.2 per cent the lesion was a postoperative recurrence. Under radium treatment, 60.3 per cent were clinically cured and only 10 per cent showed no improvement, in the lower lip cases, while 81.81 per cent were cured and 18.19 per cent improved in the upper lip cases. A special device for fastening the radium tube to the lip is illustrated.—Abstr. *J.A.M.A.*, Aug. 7, 1926.

Causes of Pyorrhea in India: The peculiar conditions prevailing in India that are etiologic factors in pyorrhea alveolaris are discussed by H. R. Hunter (*Indian Dent. J.*, July, 1926). An ill-balanced diet, composed largely of starchy foods, leads to general bodily impoverishment. Failure to masticate the food properly causes local congestion and gingivitis. The almost universal habit of "pan" chewing results in irritation, inflammation and suppuration of the gums. "Pan" is composed of an astringent leaf smeared with catachu, and wrapped around a pinch of slaked lime and bits of betel nut. The author believes that the use, as a cleansing agent, of a fresh twig from the "Neem" tree or of "Babool" wood is beneficial if care is observed. But when it is harshly used, it irritates and tears the gums. Climatic conditions are so poor that, with poor diet and disease, anemia is common. Malaria is common, and most of its victims suffer from pyorrhea.

Biologic Preparation for Study of Medicine and Dentistry: Much is said and written of the tremendous burden of the professional course; but if the student entered the professional school trained in intellectual honesty, in critical discriminative observation, with an introduction as to methods in solving biologic problems, and added to these, a definite habit of effectual methods of study, this burden would largely disappear, except for the mentally incompetent or the habitually indolent, neither of whom has any reason to aspire to a profession. My thesis is that, since the training for a professional career is a continuous process, in which at least the undergraduate college must jointly and nearly equally share the responsibility with the professional school, in the college more attention should be given to training men in those capabilities requisite to professional life, a few of which I have discussed, and this is more important than imparting information. The information as a by-product, if courses of proper subject matter are selected, will be sufficient for the professional school to build on. In inculcating these characteristics, the teacher in the undergraduate college has a distinct advantage over the teacher in the professional school. He gets the student two or three years earlier, when his mind is more mobile and his habits less firmly fixed, and he has a greater latitude in choice of courses and their content to serve as a vehicle for this training than is possible in the necessarily more rigid professional curriculum. Here is where undergraduate college teachers can best serve their time and generation through the agency of students destined for professional careers.—F. C. Waite, in *J.A.M.A.*, Aug. 21, 1926.

Old Age: An Increasing Problem: The diseases and conditions which produce illness and death at the later ages present a picture rather different from that of the other periods. Some diseases are preeminently those of old age. Organic heart disease stands out as the first in the list of conditions causing death in old age, responsible for 21.5 per cent of the deaths; cerebral hemorrhage and apoplexy account for 13.6 per cent; Bright's disease for 11.9 per cent; cancer for 9 per cent; pneumonia for 7.6 per cent. Together, these five causes are responsible for 63.6 per cent of all the deaths occurring after the age of 65. Tuberculosis, which, of course, is most prominent in the working-period of life, plays an important part in the later years also. The death rate from tuberculosis is almost as high in old age as it is at 25. Its relative importance is, however, overshadowed by the increased mortality from the other causes. Suicide shows its highest rate in old age and accidents also play a rather important part. It is interesting to find that senility is only slightly more important than accidents as a cause of old-age mortality. After 65 we are concerned not so much with the results of infection or with external

agencies as with a breakdown of the internal organism. The old machine gets worn out and apparently very little that medicine has been able to accomplish thus far has found its effect in the period of old age.—Louis I. Dublin, in *Survey*.

Full Upper Tooth Plate Removed from Esophagus: A case of foreign body of large size and tolerated for a great length of time in the esophagus is reported by G. S. McReynolds (*J.A.M.A.*, Aug. 7, 1926). A full upper plate was aspirated by the patient, aged 65, an alcoholic, who was seemingly unaware of the occurrence. He was treated for diphtheria. Difficulty in breathing, talking and swallowing persisted, with much secretion forming in the throat, but no cyanosis or pain. In little more than a month, the weight fell off 30 pounds. On the thirty-third day, a laryngeal mirror revealed "something white extending across the throat on a level with the top of the larynx." A smooth substance could be felt with the finger. With the aid of a Jackson adult laryngoscope and forceps the plate, measuring 2⅛ x 2⅛ inches, was removed.

Community Dentistry: From our experience the dentist needs to be alive to his responsibility in the care of children's teeth. So many times do our nurses receive reports from families that their dentists do not care to work on the young children. Surely the members of the profession are remiss in their duty when they take this attitude. The dental student must be impressed with the importance of the care of children's teeth. Again, we feel that much can be done if the dental profession were awake to its duty to pregnant women, not only as to their individual needs, but also to guide and advise them as to the proper diet, etc., that will insure so far as possible good teeth for the expected children. Why should not the dentist and the physician assure themselves that there are no conditions left unattended that may result in poor or bad health for the coming baby?—H. N. Bundesen, in *Chicago Dent. Soc. Bull.*, Sept. 24, 1926.

Mercurial Poisoning from Dental Fillings: Flury (*Münch. med. Wochenschr.*, June 18, 1926) concludes that mercury poisoning was possible with the old fashioned amalgams, especially of copper, but not with the complex mixtures which are being used at present. He believes that about 1 mg. of mercury per day might cause a mercury poisoning. The amount of mercury contained in a filing could yield only fractions of a milligram if resorbed within five to ten years. Stock, who has suffered, together with his collaborators, from chronic mercury poisoning due to the mere presence of mercury in his laboratory, which was not diagnosed until recently, points out that far smaller amounts of mercury—some hundredths of a milligram daily—may cause chronic poisoning in a few years. Its symptoms are slight headaches, mental fatigue, impaired memory, irritability, restlessness and chronic colds. He has learned recently about fifty similar cases among chemists and physicists.—Abstr. *J.A.M.A.*, Aug. 28, 1926.

Research on Twins: Waardenburg (*Nederlandsch Tijdschr. v. Geneesk.*, June 26, 1926) often found the finger prints so closely alike in his research on twenty-five pairs of twins that he was able by this alone to distinguish between the univitelline and the bivitelline twins. On the other hand, it is not always possibe to tell from the fetal membranes whether there was one ovum or not. In one pair of twins with striking resemblance, one had nystagmus, the other not. The parents were normal in this respect but the mother's grandmother had had nystagmus. In another pair of identical twins, one had numerous nevi, including a huge hairy one on the back, while the other had no appreciable nevi. Another pair both present squint, but one in the right, the other in the left eye. Twin girls, now aged 14, have a gap in the row of upper teeth, alike in both but on different sides.—Abstr. *J.A.M.A.*, Aug. 14, 1926.

Treatment of Tumors of the Mandible: Schuiringa and Michael (*Nederlandsch Tijdschr. v. Geneesk.*, June 26, 1926) describe three cases, with illustrations, which demonstrate the advantages of refraining from the use of the customary temporary rubber prosthesis at once after resection of the bone of the lower jaw. Instead of this, they apply a device to form an inclined plane on which the upper teeth slide. This counteracts the tendency to retraction and further deformity. When conditions do not allow this, a simple prosthesis attached with strings to the upper teeth, with cheek protectors, answers the purpose.—Abstr. *J.A.M.A.*, Aug. 14, 1926.

Histopathology of Syphilitic Hypoplasia of the Teeth: A historical review is presented (Louis J. Karnosh, *Arch. Dermat. & Syph.*, January, 1926), in which it is pointed out that the chronology of enamel deposition, as stated by some authors whose views have been widely accepted, does not agree with the chronology as determined by the writer by compilation. The author studied hypoplasia in extracted teeth with reference to his previously constructed chronologic table. The belief is stated that acute exanthems may explain sharply defined hypoplastic zones and honeycomb notches (though no good evidence is noted to support this view). The chief aberration in the typical Hutchinson tooth is one of gross deformity of the developmental lobes as well as of size. The outstanding defect involves the incisal edge of the middle lobe. All of the lobes are undersized at the biting edge, thus giving the tooth a peg shape. Cross striations or shoulders are not a part of the typical Hutchinson tooth. A Hutchinson tooth is laid down with the enamel and dentine organs not only functioning deficiently, but previously undersized. The general picture is one of fairly intensive hypoplasia in the first year of life with gradual improvement thereafter. Contrary to some of the previous views, the cusp of the first molar is very incompletely formed at birth, thus allowing an opportunity for illnesses in the first year to leave their impress on the cusp. Marked hypoplasia in the first year gives rise to the mulberry molar which the author thinks to be characteristic of syphilis, though the possibility is admitted that a nonsyphilitic disease may cause the same deformity. From casual inspection, it is somewhat difficult to distinguish the deformities of the molar occurring as a result of disease in the first year and those resulting from disease in the second year. Presumably only those changes of the first year would be due to syphilis. Apparently in all instances in the study in which the first permanent molars were affected in the first year zone, presumably by syphilis, that part of the crown which is laid down before birth was well formed. Parallel with this observation is the one that the only changes in the first set of teeth which could be attributed to syphilis occurred at the proximal ends of the second molars. This part of the second molar is laid down after birth. "A time factor of congenital syphilis as a cause of dental hypoplasia seems to be established in the first year of life, the effects coming on suddenly at birth and being concurrent with the stomatitis, rhinitis and other familiar symptoms of syphilis in the new-born."—Abstr. *Am. J. Dis. Child.*, August, 1926.

Signs of Health: Teeth: The teeth of a healthy child are strong and placed far enough apart for their alignment to be even. The grinding surfaces of the lateral teeth meet directly. The upper incisors and canines slightly overlap the lower, providing the scissor-like action intended for these teeth. All of the teeth are clean, smooth, well enameled, and free from caries. The gums are firm. It is obvious that dental defects include not only dirty, carious teeth but poor enamel, malocclusion, and spongy, retracted gums.—Hugh Chaplin, in *J. Home Economics*, September, 1926.

Rash and Stomatitis from Arsphenamine: Carréra (*Prensa Méd.*, April 10, 1926) reports that a young woman, aged 18, with a three plus Wassermann reaction and signs of congenital syphilis, had been given mild mercurial treatment a year before. As severe headaches persisted, he gave a course of neoarsphenamine, beginning cautiously, reaching a total of 4.5 gm. Then a severe eruption developed, accompanied by intense stomatitis, and gingivitis, enormous edema of the tongue and inside of the cheeks, and ulcerations. A laryngologist consulted assumed that the lesions were due to syphilis, and began treatment with arsphenamine. If this had been continued, serious results might have been entailed. Under internal treatment with epinephrine and local application of hydrogen peroxide creams, the morbid conditions slowly subsided by the end of the second month.—Abstr. *J.A.M.A.*, Aug. 7, 1926.

Toothache of Otitic Origin: Castéran (*Rev. Med. Latino-Americana*, April, 1926) relates that he has encountered a number of cases of otitis media in which pain in the teeth was the predominant element in the clinical picture. The dentists could find nothing to explain the odontalgia, but it subsided at once and permanently after the cure of the ear affection or even after mere paracentesis. There was nothing to indicate seepage of pus, and the crossing of the nerve

fibers in Arnold's ganglion readily explains the secondary neuralgia and its limitation to certain lower teeth.—Abstr. *J.A.M.A.*, Sept. 4, 1926.

Clean Teeth With Brush and Water: The chief value of flavored mouth washes, tooth powders and pastes is suggestive, as most persons are more likely to use them regularly than they would use tooth brush and plain water. (Bernard Fantus in *Hygeia*, August, 1925.) Antiseptics are entirely superfluous in mouth hygiene. Poisons that would kill the bacteria in the mouth would also destroy the cells lining the mucous membrane of the mouth. Even if the mouth could be sterilized or rendered alkaline, as is claimed for some mouth washes, it could not be kept so. As soon as the mouth is opened, it would probably be contaminated with the micro-organisms that are present nearly everywhere, and the constant flow of saliva would quickly wash the antiseptic solutions out of the mouth. Without food, the micro-organisms cannot multiply, so by keeping the mouth free from food particles and other dead material, their reproduction can be minimized to such an extent that they can do no harm. The saliva could do this if it were not for the natural crevices between the teeth and gums. Animals keep these crevices clean by their coarse food. Because civilized man eats soft food and has a very small jaw bone, with the teeth set close together, he must use a toothbrush and wash his mouth with water. This water may or may not be flavored and colored. Prepared chalk, which is cheap and safe, may be used instead of the more expensive pastes and powders.

Cod Liver Oil and the Sun as Health Aids: Dr. Louis W. Sauer (*Hygeia*, September, 1926) says that two of the physician's allies in keeping children well, are cod liver oil and sunlight. The condition of the bones and teeth, particularly the unerupted teeth, is affected by diseases such as congenital syphilis and scarlet fever, but even more by diet and hygiene. Rickets is a disorder of nutrition that exerts a harmful effect on the bones and teeth by producing in them a faulty deposition of calcium phosphate. This faulty deposit is not due to an inherent quality of the bones and teeth but to a deficiency in the blood serum that bathes and feeds these structures of the body. Cod liver oil contains a specific curative substance for this disease called the antirachitic vitamin, which mobilizes in a physiologic way the calcium and phosphorus of the blood serum. Scientists have also learned properly to appraise sunlight. Besides the warmth that the sun radiates to the earth, it sheds invisible rays that make plants and animals grow. For that reason sun baths on warm days are very beneficial. However, the skin must be exposed gradually, so as to prevent serious burning. On very hot days sun baths should be given before eleven or after three o'clock.

Correct Way to Brush Teeth: The most efficient weapon for combating dental disease is the toothbrush, (William H. Gardner in *Hygeia*, September, 1926). Most toothbrushes are too large and ill shaped for effective brushing, and most people spend too little time on brushing and employ the wrong method. The brush should be small, about 1¼ inches long at the bristle end, and fairly stiff. No toothbrush can be made to conform to the dental arch, both outside and inside, so it is best to use a small brush and brush a few teeth at a time. Brushing of the teeth has two functions: it must really clean all surfaces; and it must stimulate the gums to make them resistant to injury and infection. The bristles should be placed at right angles to the long axis of the teeth and a gentle pressure applied; at the same time the brush should be wriggled, so that the bristles penetrate between the teeth and clean the crevices. All the surfaces of the teeth should be brushed this way, doing a few at a time. The mouth may then be rinsed with water, to remove the particles loosened by the brushing. The process should take from three to five minutes after one has learned it, but as much as a half-hour may be required at first.

DIRECTORY OF STATE SOCIETY OFFICERS AND DATES OF MEETING

Alabama—Montgomery, April 12, 13 and 14, 1927.
President: George W. Bledsoe, Cullman.
Secretary-Treas.: F. F. Perry, Montgomery.

Arizona—
President: Logan D. Dameron, Jr., 211 Goodrich Bldg., Phoenix.
Secretary-Treas.: J. Gordon Shackelford, Ellis Bldg., Phoenix.

Arkansas—Hot Springs, May 9, 1927.
President: L. B. Sims, McGehee.
Secretary-Treas.: J. H. Crume, Wilson Bldg., El Dorado.

California State—San Francisco, January, 1927.
President: John E. Gurley, 350 Post St., San Francisco.
Secretary: B. Frank Gray, 909 Hyde St., San Francisco.
Treasurer: Frederick T. West, 2519 Mission St., San Francisco.

Colorado—Colorado Springs, June 15, 16, 17 and 18, 1927.
President: C. S. Kramer, Woodmen.
Secretary: Harry B. Talhelm, 502 Mack Bldg., Denver.
Treasurer: C. H. Peterson, 412 Metropolitan Bldg., Denver.

Connecticut—New London, April 28, 29 and 30, 1927.
President: Clarence G. Brooks, 302 State St., New London.
Secretary-Treas.: Joseph A. Bray, 57 Pratt St., Hartford.

Delaware—Professional Club, Wilmington, September 8, 1926.
President: Edward F. Cullen, Kane Apts., Wilmington.
Secretary: Howard C. Watson, 222 Ford Bldg., Wilmington.
Treasurer: Philip A. Traynor, 807 Washington St., Wilmington.

District of Columbia—George Washington University, Washington, Commencing 2nd Tuesday in October, twice monthly on second and fourth Tuesdays through June.
President: Chas. R. Shelton, 1029 Vermont Ave., Washington.
Secretary: W. M. Simkins, 720 Woodward Bldg., Washington.
Treasurer: Mark F. Finley, 1928 I. St., N.W., Washington.

Florida—Daytona Beach, October 28, 29 and 30, 1926.
President: R. M. Sheetz, Bradenton.
Secretary: H. G. Bow, DeLand.
Treasurer: Roy J. Denning, Kissimmee.

Georgia—Albany, June, 1927.
President: F. C. Wilson, 12 Jones St., Savannah.
Secretary: G. A. Mitchell, Candler Bldg., Atlanta.
Treasurer: Witherspoon Wallace, Candler Bldg., Atlanta.

Hawaiian Islands—Honolulu, December, 1926.
President: John R. Wikeen, Damon Bldg., Honolulu.
Secretary: John Knight, Young Bldg., Honolulu.
Treasurer: H. P. Choy, Cor. King and Nuuanu Sts., Honolulu.

Idaho—Pocatello, March or April, 1927.
President: A. G. Miller, Anthony.
Secretary: H. B. Colver, Idaho Bldg., Boise.
Treasurer: S. S. Evans, Preston.

Illinois—Peoria, May 10, 11, and 12, 1927.
President: Wm. F. Whalen, 906 Lehmann Bldg., Peoria.
Secretary: Albert E. Converse, Leland Office Bldg., Springfield.
Treasurer: Harold S. Smith, 1010 Belmont Ave., Chicago.

Indiana—Claypool Hotel, Indianapolis, May 16, 17, 18 and 19, 1927.
President: J. B. Carr, 706 Hume Mansur Bldg., Indianapolis.
Secretary: C. L. Byers, 2138 N. Illinois St., Indianapolis.
Treasurer: W. C. Hessler, 312 Ben Hur Bldg., Crawfordsville.

Iowa—Des Moines, May 3, 4 and 5, 1927.
President: J. E. Forney, Masonic Temple, Keokuk.
Secretary: John Scholten, 306 American Trust Bldg., Cedar Rapids.
Treasurer: Frank Fourt, Fairfield.

Kansas—Topeka, April 18, 19 and 20, 1927.
President: E. E. Carpenter, Topeka.
Secretary: C. K. Weaver, Clay Center.
Treasurer: W. T. Triplett, Salina.

Kentucky—Louisville, April 5, 6 and 7, 1927.
President: M. B. Guthrie, McClelland Bldg., Lexington.
Secretary: Frank B. Hower, Francis Bldg., Louisville.
Treasurer: H. J. Patrick, Paint Lick.

Louisiana—New Orleans, March, 1927.
President: F. J. Wolfe, 109 Baronne St., New Orleans.
Secretary: Leo J. Schoeny, Donaldsonville.
Treasurer: O. J. Ory, Garyville.

Maine—Rockland, June, 1927.
President: Geo. A. Phillips, Bangor.
Secretary: Wallace F. Fogg, Waterville.
Treasurer: I. E. Pendleton, Lewiston.

Maryland—Baltimore, May 2, 3 and 4, 1927.
President: Alex H. Paterson, Commonwealth Bank Bldg., Baltimore.
Secretary: Norval H. McDonald, 304 Morris Bldg., Baltimore.
Treasurer: Walter E. Green, 2958 W. North Ave., Baltimore.

Massachusetts—Boston, May 2, 3, 4, 5 and 6, 1927.
President: W. Vernon Ryder, 15 Bay State Road, Boston.
Secretary: William H. Gilpatric, 358 Commonwealth Ave., Boston.
Treasurer: Joseph T. Paul, 419 Boylston St., Boston.

Michigan—
President: Jas. D. Locke, 206 Metz Bldg., Grand Rapids.
Secretary: Wm. R. Davis, Michigan Dept. of Health, Lansing.
Treasurer: Edwin J. Chamberlain, 519 Ashton Bldg., Grand Rapids.

Minnesota—St. Paul, February 23, 24 and 25, 1927.
President: C. H. Turnquist, 505 Donaldson Bldg., Minneapolis.
Secretary: R. G. Keyworth, 1048 Lowry Bldg., St. Paul.
Treasurer: T. D. Abernathy, Rochester.

Mississippi—Gulf Port.
President: R. S. Neyland, Lamar Life Bldg., Jackson.
Secretary: C. A. Moore, Lexington.
Treasurer: C. K. Bailey, Grenada.

Missouri—St. Louis.
President: George B. Winter, Frisco Bldg., St. Louis.
Secretary: H. C. Pollock, Metropolitan Bldg., St. Louis.
Treasurer: J. F. McLellan, Moberly.

Montana—Billings.
President: E. J. Crary, Choteau.
Secretary-Treas.: J. E. Buehler, 411 Ford Bldg., Great Falls.

National Capital—George Washington University, October 5, 1926.
President: Chas. E. Detmer, 5522 Connecticut Ave., N.W., Washington.
Secretary-Treas.: Philip A. Wood, 411 Cedar St., Takoma Park.

Nebraska—Omaha, May 16, 17, 18 and 19, 1927.
President: P. J. Hunter, 811 City National Bank Bldg., Omaha.
Secretary: H. E. King, 546 Peters Trust Bldg., Omaha.
Treasurer: G. L. Spencer, 716 Security Mutual Bldg., Lincoln.

Nevada—Reno, December 4, 1926.
President: F. H. Phillips, Reno.
Secretary: Geo. A. Carr, Reno.
Treasurer: P. H. Phillips, Reno.

New Hampshire—
President: C. J. Washburn, Concord.
Secretary: W. J. Moyles, 1061 Elm, Manchester.
Treasurer: W. A. Young, Concord.

New Jersey—Newark, April (?), 1927.
President: John S. Owens, 109 North Fifth St., Camden.
Secretary: F. K. Heazleton, 223 E. Hanover St., Trenton.
Treasurer: A. E. Boice, Broad St. Bank Bldg., Trenton.

New Mexico—Roswell, June (?), 1927.
President: Thos. J. Pearson, Roswell.
Secretary-Treas.: C. C. Robinson, Barnett Bldg., Albuquerque.

New York—Hotel Statler, Buffalo, May 18, 19 and 20, 1927.
President: Guy M. Fiero, 40 North St., Buffalo.
Secretary: A. P. Burkhart, 57 E. Genesee St., Auburn.
Treasurer: George H. Butler, 314 Waverly Ave., Syracuse.

North Carolina—Greensboro.
President: Burwell F. Hall, Asheville.
Secretary-Treas.: Dennis F. Keel, 335 Jefferson Bldg., Greensboro.

North Dakota—Fargo.
President: C. A. Putney, 539 de Lendrecie Bldg., Fargo.
Secretary: Henry H. Ewy, 536 Lendrecie Bldg., Fargo.
Treasurer: R. S. Towne, Bismarck.

Ohio—Columbus, December 7, 8, and 9, 1926.
President: C. W. Strosnider, 683 E. Broad St., Columbus.
Secretary: Edward C. Mills, 255 E. Broad St., Columbus.
Treasurer: A. O. Ross, 807½ North High St., Columbus.

Oklahoma—Oklahoma City.
President: T. Wallace Sorrels, 906 Medical Arts Bldg., Oklahoma City.
Secretary: Roy H. Ellis, Hamilton Bldg., Okmulgee.
Treasurer: C. A. D. Beer, Enid.

Oregon—
President: O. T. Wherry, Stevens Bldg., Portland.
Secretary: F. W. Hollister, Morgan Bldg., Portland.
Treasurer: O. J. Ferris, Medical Arts Bldg., Portland.

Pennsylvania—Pittsburgh.
President: P. V. McParland, 706 Highland Bldg., Pittsburgh.
Secretary: A. C. Barclay, 914 Highland Bldg., Pittsburgh.
Treasurer: A. B. Miller, 299 Wyoming Ave., Kingston.

Porto Rico—San Juan, July (?), 1927.
President: Jose Vicente, San Justo St., San Juan.
Secretary: Jose Hernandez Gutierrez, Allen St., San Juan.
Treasurer: Ramon Fernandez Carballo, Stop 19, Santurce.

Rhode Island—Providence, October, 1926.
President: Charles J. Smith, 146 Westminster St., Providence.
Secretary: Edward F. Gill, Olneyville Sq., Providence.
Treasurer: Philip A. Duffy, East Greenwich.

Southern California—
President: J. Walter Gray, 910 Union Bank Bldg., Los Angeles.
Secretary: James W. Carson, 1209 Brockman Bldg., Los Angeles.
Treasurer: H. F. Boeckman, 222 Security Bldg., Pasadena.

South Carolina—
President: M. L. Brockington, Florence.
Secretary: T. C. Sparks, State Board of Health, Columbia.
Treasurer: J. A. S. Pike, Palmetto Bldg., Columbia.

South Dakota—Sioux Falls, May 9, 10 and 11, 1927.
President: L. S. Spencer, Watertown.
Secretary: E. W. Elmen, Sioux Falls.
Treasurer: E. O. Dietrich, Sioux Falls.

Tennessee—Memphis, May, 1927.
President: C. E. Hines, Central Bank Bldg., Memphis.
Secretary-Treas.: C. W. Hoffer, Hitchcock Bldg., Nashville.

Texas—Austin, May 10, 11, 12 and 13, 1927.
President: Trim Huston, Corsicana.
Secretary-Treas.: J. G. Fife, Medical Arts Bldg., Dallas.

Utah—Ogden.
President: E. E. Greenwell, Eccles Bldg., Ogden.
Secretary-Treas.: R. C. Dalgleish, 910 Deseret Bank Bldg., Salt Lake City.

Vermont—Burlington, May (?), 1927.
President: Earl E. Johnson, Rutland.
Secretary: Lloyd C. Robinson, 187 College, Burlington.
Treasurer: Howard F. Killary, 187 College, Burlington.

Virginia—Virginia Beach, Spring, 1927.
President: W. N. Hodgkin, Warrenton.
Secretary-Treas.: A. M. Wash, Med. College of Virginia, Richmond.

Washington—Seattle, Summer of 1927.
President: W. I. Ferrier, Medical & Dental Bldg., Seattle.
Secretary-Treas.: Will G. Crosby, Medical & Dental Bldg., Seattle.

West Virginia—Martinsburg, May 16, 17 and 18, 1927.
President: N. P. MacDermid, Charleston.
Secretary: F. M. Farnsworth, Buckhannon.
Treasurer: J. S. Stone, Clarksburg.

Wisconsin—Milwaukee, July 12, 13 and 14, 1927.
President: George A. Stratton, Oshkosh.
Secretary: R. W. Huegel, 104 King St., Madison.
Treasurer: P. A. Howell, Kresge Bldg., Beloit.

Wyoming—Thermopolis, June, 1927.
President: L. C. Hunt, Lander.
Secretary: E. C. Andrew, 320 Citizens Bk. Bldg., Cheyenne.
Treasurer: Peter Appel, Jr., Hynds Bldg., Cheyenne.

Announcements

CALENDAR OF MEETINGS*

NATIONAL SOCIETIES

American Society of Orthodontists, May 3-6, 1926, Chicago, Illinois.

STATE SOCIETIES

District of Columbia, at George Washington University, Washington, D. C., second and fourth Tuesdays in each month from October to June inclusive.

November (1926)

Arizona, at Phoenix.

December (1926)

Nevada, at Reno (4).
Ohio, at Columbus (7).

January (1927)

California, at San Francisco.

February (1927)

Minnesota, at St. Paul (23-25).

March (1927)

Louisiana, at New Orleans.

April (1927)

Alabama, at Montgomery (12-14).
Connecticut, at New London (28-30).
Kansas, at Topeka (18-20).
Kentucky, at Louisville (5-7).
New Jersey, at Newark.

May (1927)

Arkansas, at Hot Springs (9).
Illinois, at Peoria (10-12).
Indiana, at Indianapolis (16-19).
Iowa, at Des Moines (3-5).
Maryland, at Baltimore (2-4).
Massachusetts, at Boston (2-6).
Nebraska, at Omaha (16-19).
New York, at Buffalo (18-20).
South Dakota, at Sioux Falls (9-11).
Tennessee, at Memphis.
Texas, at Austin (10-13).
Vermont, at Burlington.
West Virginia, at Martinsburg (16-18).

June (1927)

Colorado, at Colorado Springs (15-18).
Georgia, at Albany.
Maine, at Rockland.
New Mexico, at Roswell.
Wyoming, at Thermopolis.

July (1927)

Porto Rico, at San Juan.
Wisconsin, at Milwaukee (12-14).

Chicago Dental Society, at Chicago, Illinois, January 26-28, 1927.

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

California, at San Francisco, December 4, 1926. Secretary, O. E. Jackson, 155 Kentucky Street, Petaluma, California.

Connecticut, at Hartford, November 16-18, 1926. Recorder, A. B. Holmes, Waterbury, Connecticut.

Indiana, at Indianapolis, November 8, 1926. Secretary, J. M. Hale, Mt. Vernon, Indiana.

Iowa, at Iowa City, December 13-16, 1926.

Kansas, at Wichita, December 6-10, 1926. Secretary, George E. Burket, Kingman, Kansas.

Minnesota, at Minneapolis, December 13-18, 1926. Secretary, F. E. Cobb, 601 Donaldson Building, Minneapolis, Minnesota.

*Announcements must be received by the ninth of the month in order to be published in the forthcoming issue of THE JOURNAL.

Nevada, at Reno, December 15, 1926. Secretary, C. E. Rhodes, Reno, Nevada.

New Jersey, at Trenton, December 6-11, 1926. Secretary, John C. Forsyth, 148 West State Street, Trenton, New Jersey.

North Carolina, at Raleigh, January 10, 1927. Secretary, H. O. Lineberger, Raleigh, North Carolina.

Pennsylvania, at Philadelphia and Pittsburgh, December 6-9, 1926. Secretary, Alexander H. Reynolds, 4630 Chester Avenue, Philadelphia, Pennsylvania.

South Dakota, at Sioux Falls, January 3, 1927. Secretary, G. G. Kimball, Mitchell, South Dakota.

Texas, at Dallas, December 6-9, 1926. Secretary, D. C. Johnson, Atlanta, Texas.

FIRST DISTRICT DENTAL SOCIETY OF NEW YORK

The Better Dentistry meeting of the First District Dental Society of New York will be held, December 6-8, 1926, at the Hotel Pennsylvania, New York City. This meeting will be a fitting successor to the Better Dentistry meeting of 1925, which demonstrated conclusively the demand which exists for this type of meeting in the metropolitan area.

The meeting will exemplify the best in the dentistry of today, presented in such a manner that each dentist who attends may learn something that will be helpful in his practice.

Among the more prominent of the essayists will be Rupert E. Hall of Chicago, Edward H. Hatton of Chicago and Dr. Russell L. Haden of Kansas City. An oral hygiene luncheon will be given on Wednesday.

Unexcelled clinics will be presented, illustrative of all phases of practice.

Topic discussions, which were found so valuable last year, will also be on the program.

The meeting will be conducted on the same professional plan as the meeting of last year. There will be no manufacturers' exhibit.

BOARD OF DENTAL EXAMINERS OF CALIFORNIA

The Board of Dental Examiners of California will hold an examination for a license to practice dentistry in San Francisco, Dec. 4, 1926, instead of Jan. 8, 1927.

O. E. JACKSON, *Secretary*,
155 Kentucky St., Petaluma, Calif.

IOWA STATE BOARD OF DENTAL EXAMINERS

The Iowa State Board of Dental Examiners will meet at the State University of Iowa College of Dentistry, Iowa City, Dec. 13-16, 1926, at 9 a. m., for the purpose of examining applicants for a license to practice dentistry in Iowa. An examination for dental hygienists will be given. For further information and application blanks, address the State Department of Health, Capitol Building, Des Moines. All papers and credentials must be filed with the department at least fifteen days prior to date of examination.

KANSAS STATE BOARD OF DENTAL EXAMINERS

The Kansas State Board of Dental Examiners will hold their next examination at Wichita, the week beginning December 6.

GEORGE E. BURKET, *Secretary*,
Kingman, Kan.

MINNESOTA STATE BOARD OF DENTAL EXAMINERS

The Minnesota State Board of Dental Examiners will hold their next examination at the College of Dentistry, University of Minnesota, Minneapolis, December 13-18, inclusive. Applications must be in the hands of the secretary not later than December 1.

F. E. COBB, *Secretary*,
601 Donaldson Bldg., Minneapolis, Minn.

NEVADA STATE DENTAL BOARD OF EXAMINERS

The next regular meeting of the Nevada State Dental Board of Examiners will be held at Reno, beginning promptly at 9 o'clock, Dec. 15, 1926. For application blanks or further information, address

C. E. RHODES, *Secretary*,
Reno, Nev.

PENNSYLVANIA BOARD OF DENTAL EXAMINERS

The next regular examination by the Pennsylvania Board of Dental Examiners will be held Monday to Thursday, Dec. 6-9, 1926, in City Hall, Philadelphia, and the University of Pittsburgh, Pittsburgh. The practical examination will be held in Temple University and the University of Pittsburgh on Thursday, December 9, at 8:30 o'clock. Application papers may be secured from the Department of Public Instruction, Harrisburg. For further information, address

ALEXANDER H. REYNOLDS, *Secretary*,
4630 Chester Avenue, Philadelphia, Pa.

SOUTH DAKOTA STATE BOARD OF DENTAL EXAMINERS

The next meeting of the South Dakota Board of Dental Examiners will be held in Sioux Falls, beginning Monday, Jan. 3, 1927.

G. G. KIMBALL, *Secretary*,
Mitchell, S. D.

SIXTH AUSTRALIAN DENTAL CONGRESS

The Sixth Australian Dental Congress will be held in Melbourne, Victoria, Aug. 22-27, 1927, inclusive, in the new Anatomy School of the University of Melbourne. The dental profession in Australia is arranging to welcome fellow practitioners from other countries, and will extend to them the utmost hospitality. There will be present at the Congress the most eminent dentists in the various states of the Commonwealth and New Zealand, in addition to distinguished practitioners from other countries. The clinics, demonstrations and addresses will cover every department of dental science and art. The extensive trade exhibition will show all the latest developments of a mechanical or technical nature, and up-to-date ideas in plant and equipment. The climate in Melbourne during August and September is mild and pleasant, with day temperatures in the neighborhood of 66 F., and the nights are cool and refreshing, so that members desiring to extend their visit beyond the official dates of the Congress may be assured of a pleasant and profitable holiday in Melbourne, under ideal conditions.

TESTIMONIAL DINNER TO DR. GEORGE B. WINTER

The St. Louis Dental Society, one of the oldest dental organizations in the country, will honor Dr. George B. Winter with a testimonial dinner, December 6, in recognition of his research work done on the impacted mandibular third molar. Address communications to

J. F. ALCORN, *President*,
Metropolitan Bldg., St. Louis, Mo.

AMERICAN SOCIETY OF ORTHODONTISTS

The next meeting of the American Society of Orthondontists will be held in Chicago, May 3-6. A splendid program is assured. All ethical members of the American Dental Association will be cordially welcome. For further information, address

CHARLES R. BAKER, *Sec'y-Treas.*,
708 Church Street, Evanston, Ill.

OHIO STATE DENTAL HYGIENISTS ASSOCIATION

The Ohio State Dental Hygienists Association will be held at the Neil House, Columbus, December 1-3.

CORA V. DAVISSON, *Secretary*,
336 W. 2nd St., Dayton, Ohio.

BOOKS RECEIVED

Stedman's Medical Dictionary. A Practical Medical Dictionary of Words Used in Medicine with Their Derivation and Pronunciation, Including Dental, Veterinary, Chemical, Botanical, Electrical, Life Insurance and Other Special Terms; Anatomical Tables of the Titles in General Use, and Those Sanctioned by the Basle Anatomical Conventions; Pharmaceutical Preparations, Official in the U. S. and British Pharmacopeias and Contained in the National Formulary, and Comprehensive Lists of Synonyms. By Thomas Lathrop Stedman, A.M., M.D., editor of the "Twentieth Century Practice of Medicine" and of the "Reference Handbook of the Medical Sciences," formerly editor of the "Medical Record." Ninth,

Revised Edition. New York, William Wood and Company, 1926. Illustrated. Price, $7.50.

According to the preface to the ninth edition, several hundred new titles have been introduced and a few old ones—chiefly of proprietary drug preparations which have died a natural death through lack of advertising nourishment—have been discarded. Numerous changes have been necessary in order to conform to the new editions of the U. S. Pharmacopeia and National Formulary, in which many new drugs have been introduced and from which more have been dropped, while not a few changes have been made in the official titles. An alphabetical table of drugs and their indications has been added in the Appendix, and the plates have been distributed through the body of the work so as to be more directly of service in supplementing the definitions.

PATENTS OF INTEREST TO DENTISTS

1601650. Articulating Fluids, M. Segal, Chicago, Ill.

1485519. Attachment for toothbrushes, Robert O. Nelson, San Francisco, Calif.

1485873. Dental articulator, James M. O'Keefe, Brooklyn, N. Y.

1486039. Dental impression tray, Juan de J. Santos, New York, N. Y.

1485569. Casting machine, Fred F. Schroder, Chicago, Ill.

1485657. Dental articulator, Frank L. Williams, Denver, Colo.

1486544. Centrifugal casting apparatus, John A. Rathbone, Detroit, Mich.

1486266. Amalgam mixing device, James S. Rosenblatt, Chicago, Ill.

1487215. Floss container and paste expressor, Richard T. Dial, Columbia, S. C.

1486957. Toothbrush container, Arthur E. England, Brooklyn, N. Y.

1487330. Dental or other furnace or oven, George M. Hollenback, Lewiston, Mont.

1487392. Dental impression tray, Peyton A. Lee, Coushatta, La.

1487075. False tooth cleaner, H. H. Olson and J. E. Stevens, Ben Lamond, Calif.

1487698. Orthodontic appliance, Julius Aderer, New York, N. Y.

1488315. Cleanser for artificial teeth, E. B. Castleman, Spokane, Wash.

1488097. Dentifrice, Henry N. Creger, San Francisco, Calif.

1488099. Dental appliance, Leon De Fernelmont, Clifton, N. J.

1488335. Driving attachment for dental articulators, W. M. Gambill, Merkel, Texas.

1487776. Dental tool, Jacob Goldberg, Philadelphia, Pa.

1488262. Dental oven, Eugene Maginnis, Evanston, Ill.

1488214. Toothbrush, Saul Mason, South Bend, Ind.

1489024. Dental amalgam or alloy mixer, Ira A. Burnett, Chicago, Ill.

1489192. Adjustable dental tray, Ernest A. Cleveland, Montreal, Canada.

1488627. Removable bridgework attachment, Isidore Stern, New York, N. Y.

1488961. Toothbrush container, W. S. Walbridge, Perrysburg, Ohio.

1489760. Apparatus for casting dental fillings, Jay A. Heidbrink, Minneapolis, Minn.

1489761. Device for casting dental fillings, Jay A. Heidbrink, Minneapolis, Minn.

1490090. Dental apparatus, Martin F. Burns, Astoria, N. Y.

1490214. Dental amalgam mixer, Alvin L. Johnson, Rock Falls, Ill.

1490625. Dental casting machine, Felix C. Montuori, Washington, D. C.

1490645. Holder and dispenser for dental stoppings, E. W. Szwajkart, Chicago, Ill.

1491129. Dental crown setting tool, Demeter Bouyoucoglou, St. Louis, Mo.

1491408. Dentifrice, R. A. Kuever, Iowa City, Iowa.

1491739. Dental switchboard bracket table, Percy Russell, Swarthmore, Pa.

1491740. Anesthetizing gas and producing the same, T. A. Swartz, Huguenot Park, N.Y.

1492299. Tooth-paste composition, Karl J. Kyle, J. A. Binford, and J. T. Waddell, Wellsville, Kan.

1492534. Tooth paste holder, John W. Quadt, and F. Metzner, Brooklyn, N. Y.

1492660. Toothbrush, Harry J. Akrus, Philadelphia, Pa.

1493417. Dental impression tray, Lex C. Arnett, Clinton, Ind.

1493331. Appliance for cleaning teeth, James R. Fair, Dublin, Ireland.

Copies of the foregoing patents may be obtained for twenty-five cents each, by addressing John A. Saul, Solicitor of Patents, 509 Seventh St., N. W., Washington, D. C.

THE STATUE OF LIBERTY OF BUSINESS

By Ernest V. Madison

ADVERTISING might be likened, metaphorically, to the Statue of Liberty, that colossal bronze figure which is so impressively located in New York harbor.

Just as the statue indicates to the immigrant a country where he is privileged to an equal citizenship, so does advertising indicate to the business man:

—a country where he is privileged to buy and sell on an equal basis with other citizens;

—a country where business is transacted on a higher plane—where there is but little of the deceit, favoritism and haggling so characteristic of nonadvertising oriental and occidental commerce;

—a country where education governs buying; where the prospective purchaser is fed with facts by the seller;

—a country where the smallest manufacturer or distributor is given the opportunity to use all publicity and selling mediums, and at published standard rates.

Would it be correct, therefore, to term advertising *"The Statue of Liberty of Business?"*

And if this be allowable, can we not consider the advertising section of this issue of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION a torch flame of the statue, lighting for its readers the ways to *Interest, Knowledge* and *Profit?*